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THE RELATION OF COGNITION AND PHANTASY IN CHILDREN

By M. D. VERNON
From the Cambridge Psychological Laboratory

PART II

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IV. COGNITION AND PHANTASY IN MALADJUSTED CHILDREN

(1) *Deficiencies in the cognitive functions*

We have traced the development in the normal child of the stages of cognition and of its relation to phantasy, and brought evidence to show that it is necessary that these two modes of thinking should be closely integrated for the individual to understand intelligently and imaginatively. We obtain further evidence of this from the study of maladjusted children who have not achieved this integration, and in whom the development of either cognitive activity or phantasy seems to be abnormally retarded or inhibited.

The retardation of cognitive development is most familiar in the mental deficient, in whom cognition appears in a relatively undeveloped and undifferentiated condition. But there are other children whose cognitive ability appears to be temporarily reduced through somatic deficiencies or through emotional difficulties. Often these two conditions are coexistent.

As might be expected, the retarded child frequently responds in a manner similar to that used by younger children. Thus he may show a tendency to enumeration; for instance Alfred C. (age 9–7, I.Q. 76) in Exp. A gave responses of the type: "House and some trees and the path and a house; sky and a few *birds*."[1] But this is not the simple enumeration of the little child, but a form of compound enumeration which, as Binet pointed out, is rather characteristic of the child of low intelligence. It probably indicates that the child's power of observation of qualifying details has increased, without any corresponding increase in his ability to construct coherent verbal expressions. At a slightly higher level of intelligence the child may when interested be capable of descriptive responses, but will relapse into pure enumeration when it requires less effort to pick out details one after the other. Thus Fred C. (age 9–7, I.Q. 86) in Exp. B responded to the Tavern Brawl with:

> Two men went to stop one man; another man went to stop the other one; all the glasses knocked down on the floor; and man and a lady were frightened.

This is quite an adequate descriptive response. But for the Runaway Horse, which apparently he did not understand, he gave: "A horse; a milk-cart; a boy; a lady", etc. This is only a simple enumeration. It seemed that Fred's apparent low intelligence was in part due to poor health and physique and poor home environment. And it is probable that a child who suffers in this way, and not from a high degree of innate dullness, may at times fall back on a really childish form of response such as simple enumeration. Even a normally intelligent child with a physical handicap may tend to use a childish type of response. Thus Kenneth B. (age 7–1, Binet I.Q. 98, Performance I.Q. 126) was physically below par and suffered from deafness; he gave responses in Exp. A of the type: (C 3) "*Ship, house, sea, pathways*"; (B 4) "*trees, hill, grass, pathways*". But he could also manage a fairly good descriptive response such as: (F 3) "Two *people standing on a piece of grass*".

But the childish type of response was not always due either to innate dullness or to backwardness resulting from physical deficiencies. There was a considerable number of cases among the clinic children with normal or superior intelligence who employed either enumeration or the type of response we termed above 'designation'. In designation the child gives one or two names, sometimes briefly qualified, and then comes to a stop as if he had 'polished off' that piece of work and nothing more was required of him. These children were suffering from emotional difficulties of some kind or another which seemed to have the effect of inhibiting certain kinds of cognitive activity. One form of this inhibition was the return to the childish mode of expression. Thus Maureen P. (age 7–0, I.Q. 121) was a child who did brilliantly at school, but was given to screaming fits and uncontrollable temper tantrums.[1] In Exp. B she began with simple enumeration in responding to the Farmyard: "Three cows, three horses, three men", etc.; and to the Tavern Brawl: "Two stools tipped up, five funny men", etc. But she became more interested and less resistant by the time she reached the Runaway Horse, and gave: "A dog barking; a little girl fell over", etc., which is at least descriptive, though not very intelligently so. Kenneth M. (age 8, I.Q. 96), another aggressive child, gave responses in Exp. A which were more in the nature of designations: (C 4) "*Trees with houses on*"; (B 3) "*mountains and the sky*"; "all kinds of squares".

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[1] Words in italics denote inventions.

But this latter type of response was even more characteristic of the frightened, anxiety-ridden child, who was sometimes also physically subnormal. Thus Tom G. (age 12, I.Q. 95), who was depressed and fearful, and generally rather subnormal, gave in Exp. A: (A 4) "*A snake and a funny old man*"; (B 4) "a *map*"; (D 4) "*green grass*"; (F 2) "two *people pointing*". Leonard C. (age 7–9, I.Q. 83) was erratic, nervous, disobedient and in poor health; he gave in Exp. A: "Two *dragons*", "two *crabs*", "two *ships*", etc. These brief, apparently perfunctory, responses gave evidence of the inhibition of the normal powers of cognition; and a similar effect was demonstrated by another frequent phenomenon—perseveration. Thus Leonard gave "dragon" eight times, "ships" four times; the numeral "two" thirteen times, "three" three times, "four" twice. Another characteristic of such children was to produce inventions as if with the attitude: "Anything to save trouble, to satisfy the questioner, to make a better show, more of an answer." Thus with Leonard, "dragons" became a kind of routine invention when he could not think of anything else to say. Kenneth B. gave, "*trees, grass, pathways*", in the same way; and Alfred C., "And some *grass* and the *sky*". This type of response sometimes alternated with failure to respond. Thus Frank H. (age 10–2, I.Q. 145), nervous, anxious and fearful, observed perfunctorily, and several times said he had not seen the picture at its first exposure.

But perseveration and failure to respond are not always due to inhibition through anxiety; they may result from aggressive resistance. It is usually possible to tell from the child's general manner which state of mind is operative. Thus Kenneth M. (see above) made perseverative responses: "*mountains*" was given three times running. June C. (age 12–10, I.Q. 79) was not only of low intelligence but also obstinate and lacking in self-control; she gave several perseverative descriptive responses, and three times gave no response. Again among the ordinary school children, designation, enumeration and perseveration of a perfunctory kind not infrequently resulted from resistance; the attitude being, "I can't see any use in this and I can't be bothered to try". Jean H. (age 7–2), who was of normal intelligence and not emotionally maladjusted, but merely naughty and inclined to 'show off', gave mainly designations including "*clouds*" (ten times). Jean O. (age 10–10), who was also resistant and inclined to think the whole thing silly, gave designations throughout such as, "*mountains*", "*clouds*", "*dragon*", etc.

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[1] This and similar items of information are taken from the case histories.

The inhibition of cognition did not seem to affect the functioning of phantasy. It is true that in Exp. A phantasy was not extensive since verbal expression was poor and limited. Inventions were of a commonplace type and seldom involved conceptions of any originality. But they were frequent; and occurred sometimes with meaningful pictures as well as meaningless. Thus Alfred C. introduced into his responses to B 1 and C 1: "and a *few birds*". It is probable that there was considerable 'self-active' phantasy in these children, but it was more or less dissociated and unexpressed, as in the quite little children. In Exp. B, children of this type made free constructions at stage B, consisting as a rule of a number of separate and more or less unrelated groups; and the verbal responses were usually enumerative, or simply descriptive. The children who were rather subnormal mentally and physically showed a tendency to use the fairly peaceful and familiar type of situation. Thus Fred C. had put in people walking about a field, with various tame animals about. In the middle of these he had put a bear, and then asked what this animal was; when told it was a bear, he hastily removed it altogether. The more aggressive children constructed more unusual and dangerous situations; thus Maureen C. produced: "A sheep-dog driving some sheep, a man whipping a horse, a cat sitting on a polar bear, a giraffe eating a tree", etc. A rather interesting variety was produced by Percy C. (age 13–2, Binet I.Q. 67, Performance I.Q. 80), a child who relieved his feelings of inferiority and inadequacy by violent attacks on other children. He placed across the bottom of the field, in its lower quarter, a scene consisting of two men shooting wild animals which in their turn were attacking an elephant with a boy seated on it.

We may conclude then that the child's level of cognitive functioning may be below normal as the result of innate dullness (in which case the retardation is usually permanent), or of poor health and physique, or of some kind of emotional inhibition. There does not seem to be any lack of phantasy in these children,[1] although its expression, in so far as this requires cognitive ability, is crude and limited. It seems that either aggressive resistance or neurotic anxiety may produce this inhibition of cognition.

(2) *Over-activity of phantasy*

The amount of invention was in general greater among the clinic children than among the school children (see Table IV, Part I, p. 285); and an over-elaboration of invention was found among the former. This indicated a tendency to excessive phantasy which occurred in few if any of the normal children, and was sometimes accompanied by severe neurosis.

There appeared to be two classes of children who showed evidence of excessive phantasy. In the first class were those who were relatively little dissociated; that is to say, their behaviour showed a fair contact with reality and their phantasy was not excessively 'magical' in content. But they suffered from violent fears and aggressions. Sometimes there seemed more signs of the former, sometimes of the latter, but there was always some alternation of both, and usually a good deal of chronic anxiety. The expression of phantasy seemed to afford a relief from this anxiety in that fear and aggression were given an outlet in it, but in a more or less symbolic form since they could not be overtly expressed. Among the more aggressive children George S. (age 12–3, I.Q. 82–87) was disobedient, nervous and excitable, with a difficult temper and vicious to other children. He gave rather long and detailed responses, often involving movement, with a good deal of imaginative invention, and colour naming. Colour naming (even more striking among the fearful children) was characteristically associated with excessive phantasy; colour seemed to produce a great impression on some of these children, similar perhaps to the 'colour shock' produced by the Rorschach Ink-blots.[2] It was often named inaccurately. George gave responses such as: (B 1) "A boy getting out down at the bottom of the see-saw; the little girl's *screaming* with her hands out; a wall, reddish colour, and a sky and clouds"; (A 4) "*a duck on its head under a rock* and something like *a fish peeping out*". One of the school children, Robert S. (age 7–3), produced rather unusually violent and aggressive inventions, e.g.: (A 3) "Looked like *a rock* with *boys throwing stones*"; (A 2) "few *rocks* and some *boys cutting each other*".

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[1] It is possible that really mentally defective children are defective in phantasy also; but no data were obtained from such children.

[2] But in general the responses of these neurotic children seemed to cut across the adult 'Erlebnistypen' of Rorschach (*Psychodiagnostik*, 1932).

Among those children who suffered from anxiety and fears, the inventions often contained expressions of terrors of which they were not fully aware, or were unable to express directly. Thus in Exp. A., Hazel R. (age 8–11, I.Q. 116), a timid and tearful child with very numerous fears, produced long and very detailed descriptions of the following kind: (C 4) "Little black *path* with some *hedges* and a pink *sky* and there was a little *house* with a *red roof* and a bit of it was yellow and a bit was black, and some *green grass*"; (A 4) "some *hedges* with a black thing on top of a *hedge*—looked like a *cat*"; (B 4) "very funny—red—or orange—two bits—some *hedges*; did look funny". The words "hedges", "little" and "funny" were characteristic, and seemed to indicate the operation of a defence mechanism against her fears. Vera C. (age 8–9), who was suffering from repressed fears, gave responses which were equally detailed but more inventive. Each response contained an invention of some kind, and there was much movement and also suggestions of emotion in the persons and scenes described: (A 3) "Two *boys* next to each other, looks like they're *fighting each other*; the one on the left has got a green *hill* and the one on the right has got a *brown hill*; *they're out there all by themselves*; and a few *trees*, and the *sky* doesn't *look very bright*"; (B 1) "there were two boys on a see-saw, not holding it; look like *they're going to fall*; like little bushes on the floor; and *they're enjoying themselves*; with green and something else on it like *a hill*".

In one or two other children, phantasy seemed to be fairly extensive, but less so than in the above cases, and it was often expressed childishly and was eked out by gesticulation. Thus Joan B. (age 9–9, Binet I.Q. 107, Performance I.Q. 113), who was always day-dreaming and had fears of the dark, gave in Exp. A: (F 4) "*Ghosties*—funny things" (shrinking); (A 3) "green figures—looked as if *they was dancing—had their arms out*" (gesticulating). Sylvia H. (age 10–7, I.Q. 87+), backward, nervous and suffering from a sense of insecurity, gave: (E 3) "There's a round piece of *snake* and *the snake's going wiggle*, like *it's going to turn round*"; (A 3) "*a boy* all wiggly *with his hands out* and *a girl* all wiggly with *her hands* like this" (gesticulating). These children form a class intermediate between those in whom phantasy is over-active, and those in whom it is replaced by overt over-activity (see below).

In the second class mentioned on p. 5 were those children who seemed more dissociated, in the sense that their phantasy seemed to be abnormally self-active, uncontrolled and 'magical'. Thus responses even to meaningful pictures contained frequent inventions, and these showed how, once the phantasy had been 'touched off', it would go on of its own momentum, without conscious direction from the child. This way of expressing phantasy is not common with normal children of this age, though it is more frequent with little children. Denis H. (age 7–6, I.Q. 99) was referred for being shy and nervous with strangers, and stammering; but in this experiment he responded volubly, with no signs of shyness: (C 1) "A house and a stream going by it and some grass and windows and doors—and *knockers* and *No. 2* and *3*—like that"; (A 1) "there's a boy and another chasing him and the other's on the grass and *he's turning the corner and he's nearer his house* and the grass is green and there are *clouds in the sky*"; (E 4) "three red *people* and blue *people* and you can't see their faces; and *grass underneath them*, and *they're dancing on grass*" (repeated from F 4); "and *green grass*" was added as an afterthought several times, when there was no green grass at all. Ronald H. (age 11–0, I.Q. 120), suffering from uncontrolled tempers, gave the following: (A 4) "Few *mountains*—(afterthought) and *two boys dancing*"; (E 2) "two or three *hills* in the background and two *trees* and *a man punting a small punt* like *a barrow* and *a stream*—(afterthought) and *a few flowers on the edge of the stream*".

Another example of this type was afforded by Ernest G. (age 10–0, Binet I.Q. 80, Performance I.Q. 119), who was a very over-active child, referred for lying and disobedience. This lying was in point of fact a tendency to talk at great length about things which had never happened; i.e. it was produced by over-activity of phantasy. Ernest in Exp. B described the Tavern Brawl and the Runaway Horse rapidly, at great length and with much excitement; the Runaway Horse was "going mad down the street". His free construction, also described at great length and somewhat incoherently, contained a great number of separate groups of men and animals, mainly involved in some kind of aggressive activity, thus: "A boy kicking the cow's bottom;...a man whipping a hippopotamus;...a tiger going after one of the lambs to eat him, and the brave hippopotamus going to eat *him*", etc., etc.

There were also two cases, one a clinic child and the other a school child, who produced not only an excessive amount of phantasy but also of detailed description. The description, however, was not very accurate, and thus it differed from that to be described in § (3). It seemed as if the child's powers of observation and report were greater than normal, but that he was unable to utilize them to great advantage because over-active phantasies constantly impinged upon them and distorted them. Thus instead of a coherent and synthesized imaginative interpretation, the result was a long and detailed but distorted and inaccurate description. Or sometimes description and invention occurred side by side in the same response without any attempt to relate the two, showing the dissociation of cognition and phantasy. Harold D. (age 13, I.Q. 100), unstable, fearful and hasty-tempered, gave: (A 2) "Some sort of *people* in the shape of zigzags *running towards each other*; the man on the *right* running had a red jersey and black trousers; the man is in a *green* jersey on the left and a *black* hat and *blue* trousers and had a black outline"; (C 4) "*a fruit tree with pears and apples hanging down*—crazy kind of way—*pears were yellow and apples red*—background a kind of yellowish *green*". Michael W. (age 7–5), an intelligent but nervous and excitable school child, gave: (B 2) "*An aeroplane* and *three little men*; green and all colours and a *path*; and *they've got a piece of rope and it was tied on to the tail of the aeroplane*—I think it was *an aeroplane* or *the shadow of the aeroplane*"; (C 2) "more like *a tank* and *it came down*; like *a camp*, and a piece like *a plank of wood*; like *a wall of a house* the other side and a brown *path* and a bit of *grass*".

It is of course true that Robert S., Denis H. and Michael W. were all of them only seven years old, so that they might have been expected to be inaccurate and incoherent in their responses. But the invention and incoherence, particularly of Denis and Michael, was quite different from that of other young children which we described in previous sections, and resembled much more nearly that of the older emotionally disordered children such as Harold D.

Rather similar to Harold and Michael was Hazel M. (age 10–3, I.Q. 148) in Exp. B. Her description of the Farmyard was unnecessarily detailed, with much colour naming. Her reconstruction of the Runaway Horse was rather inaccurate, but her verbal description was detailed, and included some emotional interpretation: "A lady's running screaming out of the house; another lady's leaning out of the window wondering what she can do." Her free construction contained a number of separate and incongruous groups of figures, described in great detail and rather incoherently, though there was an attempt to give them a rational explanation:

> A zoo—the animals are allowed to mix together; a gentleman and a lady walking, behind them a leopard; the elephant has forced his way out of his cage, and the man who looks after him is running after him; a man is cracking his whip at the bear who's come out of his cage and is chasing a boy; two men are going to shoot a horse who's wild and is charging a little girl; a man is trying to stop the man who's shooting the horse, etc.

Thus the child tended to give over-elaborate descriptions of presentations which gave little opportunity for imaginative interpretation. But when such opportunity was afforded, she produced much phantasy which was extremely 'magical' in quality, and showed an almost obsessive reiteration of the theme of danger and counter-aggression.

(3) *Over-activity of the cognitive functions*

We must deal next with those children whose energy seemed to emerge in cognitive activity, sometimes in intelligent, accurate but hypercritical evaluations; and sometimes in excessively long and detailed verbal descriptions which were usually quite accurate but often unintelligent. It would appear that in these children phantasy was repressed and the expression of their desires and fears inhibited. Thus aggressive tendencies found an outlet in intellectual activity and critical evaluation of the outside world. And a means of escape from anxiety and feelings of inferiority was found in an over-elaboration of verbal response; this gave the child a feeling of power through his ability to deal with words, while at the same time concealing his inability to act, invent or, in some cases, think intelligently. We have already referred to the rather meticulous and over-conscientious children of this kind who were found among the ordinary school children (see Part I, p. 287).

An example of the first type was afforded in Exp. A by Cyril S. (age 10, I.Q. 122), a Jewish child who had reacted very aggressively to his father's authoritarian treatment. He gave very few inventions, and described the meaningless pictures as: (E 4) "Lot of paint—hasn't been used properly; there's the *sky*—that's the only good part about it"; (E 3) "paint's been used a bit better—*trees* are the wrong colour and the *pond's* red, should be blue"; and the meaningful ones as: (C 1) "Same sort of picture only done properly—house is in a different position—got windows and a door". One of his very few inventions was: (A 3) "Supposed to be two *people* there; looks like *they're going to have a fight*...". Here the child's aggressive and critical attitude had prevented him from observing properly (he was indeed much more interested in the working of the tachistoscope than in the pictures); but there was no doubt of his ability in intellectual activity. Jean Ba. (age 10–6, I.Q. 90), an equally aggressive but less intelligent child, gave somewhat the same type of response, but that her critical reactions were expressed by the word "funny"; (E 2) "*Trees* or something—looked very funny—all mixed up; and *grass*".

Another less extreme example was afforded by Lorna W. (age 9–0, I.Q. 122) in Exp. B. Here there was the same attitude of superiority, which appeared in the child's manner of speaking—in what is known colloquially as an "old-fashioned way" (i.e. like that of a sophisticated adult)—and in her response to the Runaway Horse: "A lady that's looking at a milkman that's running after the cart that's drawn by the horse; he seems to have got a little wild for the moment;...a little girl's falling over and her mummy's looking at her as if she were saying, 'Oh dear!'." But there was appreciation as well as criticism; in her response to the Farmyard occurred: "A gate and a nice wall round it (the farmyard); a nice lawn." And the free construction was described in detail. It demonstrated the child's desire for free activity, together with her wish to obtain security by clinging to the family circle. Thus she first of all arranged a group of horses, saying, "A lot of horses; I love horses"; there was a group of horses being driven by a man with a dog, also one horse running away free. In another group a fox (called a "wolf") was going to attack some sheep, and a boy was running away from the "wolf"; but a dog had "just got the wolf". The "master is shooting some other thing" (a dog), and safely away in the further corner were "a mother and a daddy with two little girls". Thus it appeared that this child, although emotionally inhibited and unable to act freely, was less completely tied to purely cognitive activity, and was able to some extent to express her phantasied longing for free activity.

Another example of the intelligent, rather aggressive and over-excitable child whose energy found an outlet in verbal activities was given by David D. (age 10–9, Binet I.Q. 120, Performance I.Q. 145). His descriptions were not made in a critical spirit, but showed great verbal elaboration and some suppressed excitement; thus for the Tavern Brawl: "Lady's got a look of terror and dismay on her face, and so's the barman." But his free construction was soon finished; it consisted of a man and two dogs attacking a fox, while a man, a woman and two children, widely separated from each other, stood round watching. Thus the danger was being driven away and segregated from the rest, the cognitive part, of the personality, and at the same time phantasy was more or less repressed.

We turn now to those cases who compensated in verbal activity for their anxieties and feelings of inferiority. Oliver G. (age 11–7, I.Q. 137) was nevertheless slow and backward in school, lacking in initiative, apologetic and afraid of ridicule and failure. In general his responses in Exp. A were objective and accurate: (C 1) "There's a small house with a red roof and yellowy walls and there's smoke coming out of the chimney and a long path going to it". There were few inventions; meaningless designs were described objectively: (D 3) "There's a green triangle and a few other coloured shapes in it"; or dismissed as impossible to describe: "Just a muddle of painting"; "worse painting". These remarks were made, not with the superior attitude of Cyril S., but with docility, as if polite but puzzled at what he was supposed to say.

But compulsive speech seemed to have reached a maximum in one rather unintelligent school child in Exp. B—Jean B. (age 11). Her responses to the various pictures are too long to quote—that for the Farmyard alone contained 163 words, with numerous repetitions and much colour naming; and it would not have ended there, had she not been stopped. But this compulsion seemed to extend to her free construction. This contained forty-two figures, arranged singly, in pairs or in small groups, and described as follows:

> Most of the people are trying to run away from the tiger and the bear; one of the horses is going nearly mad;...one of the boys is running towards the tiger and one running away;...a soldier trying to kill it, and another man behind a tree to help; a wild boar running away,...a dog going after him, another fox and two boys going after him, etc.

Thus this construction in fact resembled the incoherent constructions of stage A (see Part I, p. 288). But the child was able to give it a long, rambling, unintelligent description. It appears that phantasies of danger and aggression were not altogether repressed, but were functioning at a very childish level. At the same time she was trying to compensate for her feelings of inferiority by this method of verbal over-elaboration.

(4) *Inadequacy and repression of phantasy*

We come lastly to those children who seemed to have little ability to express phantasy, without any corresponding over-compensation in cognitive activity. These seemed to fall into two main groups: firstly those who seemed generally repressed and inhibited, lacking in any spontaneous energy; and secondly those who were apparently too dissociated for any expression of their energy in phantasy or cognition—this energy flowing over into over-activity and general restlessness.

Among the former was Ronald F. (age 12–6, I.Q. 95) who was quiet, docile, anxious, lacking in energy and initiative. His replies in Exp. A were brief; there were some inventions, but they were mainly rather commonplace, and there was some perseveration. The manner of reply was characteristic; it was stereotyped, as if the child were rigidly confined within himself and unable to emerge—see for instance the consecutive responses to F 1–4 and E 4: "Some men shooting bows and arrows"; "some *men* without bows and arrows—and *fields*"; "some *men* all in red, *walking in the country*"; "some paint all mixed up"; "some *scenery*". John N. (age 7–5, I.Q. 112), shy, nervous and full of fears, often seemed too constricted to observe and answer; seven times he was unable to give any response at all, and when he did respond, it was very briefly done: "Rough sea"; "some boats"; "little men", etc.

There were no very obvious examples of this type among the clinic children in Exp. B, but a very clear example occurred among the school children. June N. (age 11, intelligence above normal) appeared to be completely inhibited in observation and verbal description, in memory reconstruction and in free construction. She was very slow in answering and her responses were mainly simple enumerations. She had the greatest difficulty in completing her reconstruction of the Runaway Horse. In free construction, she slowly turned the figures over and over; gradually selected a few and arranged and rearranged them; and when she had finished, left the remainder of the unwanted figures lying muddled up with her construction, as if too inert to move them. The construction, which after great hesitation she called "Field", consisted of two isolated groups, one of a man, a horse and a cow; the other of a man and two horses, with a child separated from the man by a tree. Thus not only was all the more imaginative type of phantasy suppressed, but even her contact with the things of everyday life was slight.

The second class of children mentioned above included some cases of rather severe neurosis accompanied by dissociation. Derek S. (age 9, I.Q. 112+) was suffering from a severe disorder connected with an undescended testicle, which made him violent, restless and inattentive. His observation in Exp. A was careless and his responses perfunctory, since he was unable to keep his attention fixed even for that length of time. There were one or two inventions, of "worms", "reptiles", "shadows", etc.; and numerous responses of the type: "Big painting—nothing in particular"; "all wiggly-woggly men in the picture"; "all sort of isolated". John W. (age 8, I.Q. 111) was aggressive, nervous and difficult. During the experiment he was very restless and obstreperous, and expressed a desire to break the tachistoscope; he was quite interested in the pictures, but too inattentive to observe and report much. He produced rather more inventions than did Derek, but was liable to save himself trouble by perseverating, thus: (F 2) "*Two men putting their arms out*"; (F 3) "two red *men putting their arms out*"; and again: (B 3) "Some funny *clouds*"; (B 4) "some *clouds* again"; (A 4) "some very black *clouds*".

An interesting example of partial dissociation with repression of phantasy was afforded in Exp. B by Alan R. (age 11–10, Binet I.Q. 95, Performance I.Q. 79). He was nervous, restless and over-active in behaviour and unable to concentrate. His verbal responses were very rapid and incoherent; for instance, to the Runaway Horse:

> Dog's escaped and they're afraid the babies will get killed; woman rushing out of the house after them; looks as if the dog started him off going mad; and he's running after him; perhaps he's running after the dog.

The idea of escape from captivity also appeared in his response to the Farmyard: "Big wall, and they can't escape out." His constructive work was done jerkily, with great eagerness; figures were pulled out and hastily thrown aside. It was described as follows:

> Lady's walking and baby's running after her[1]; (pointing) he's taking the elephant to have a drink down there; (pointing) these two have been to do some shopping; (pointing to the wild boar) that one's asleep; (pointing to the remaining animals) eating the grass and just walking about.

Again almost the only coherent idea that emerged was of the child who had been left behind by her mother because she was naughty, and was now running after her, away from the animals. Alan presented a good example of a child in whom neither cognition nor phantasy expression were developing satisfactorily. Cognition was incoherent and distorted, and phantasy was not even fully 'self-active' but was centred about one or two *idées fixes*. In consequence, neither provided a satisfactory outlet for his energy, which tumbled over into free activity and general restlessness.

(5) *Abnormal divergences in cognition and phantasy*

It is now necessary to summarize the information obtained about the nature of the divergences in cognition and phantasy which can occur as the result of emotional maladjustment. We have seen that there may be a persistence of the childish form of response to perception, namely enumeration. But it appears that even in intellectually subnormal children the response does not consistently regress to its earlier childish form; it more commonly takes on a new form which is a modification or distortion of this. It seems that the child is unable in certain circumstances to respond in the manner which is normal for a child of his age, and he attempts to regress to an earlier form of response. But the experience and the emotional development of the older child are such that this is impossible. Therefore he does not consistently produce simple enumerations. This may occur occasionally, especially in children of poor physique or innate dullness; but compound enumeration and designation are more frequent. The former seems to be more characteristic of the compulsive type of child, the latter of the anxious and inhibited or openly aggressive types. Furthermore, if the child's interest is sufficiently aroused to overcome his inhibitions or resistances, he may produce descriptions of the kind normal for a child of his age. It is not that normal cognition is undeveloped in such children, but that it does not always function effectively. Other symptoms of this dysfunction are failure to respond, perseveration of response, and inventions of the kind described on p. 3 of the "anything to make more of an answer and satisfy the questioner" type.

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[1] He indicated that the child had done something naughty for which she was being punished, but too incoherently to be recorded.

We saw that in these cases of attempted regression to a childish type of cognition, phantasy expression appeared to be relatively normal. There seemed, however, to be a dissociation between cognitive activity and phantasy expression, a temporary blockage which was sometimes removed in states of interest or excitement. But as long as the blockage remained, comparatively little of the child's energy could flow into his cognitive activities, and the latter appeared in a distorted form of the brief and undeveloped cognition of the little child. Thus cognition was unable to develop normally. In particular, the child could not attain to the active manipulation of phantasy material, and hence the highest form of integration between phantasy and cognition constituted by interpretation and stage C of imaginative construction. It is interesting to note that none of the clinic children produced a free construction which was really a unified whole (though Stanley H. came near it).

In some cases energy seemed mainly to flow into phantasy production. The child's emotional problems seemed so acute that 'self-active' phantasy, the means *par excellence* of expressing these problems, absorbed a large part of his energy. His cognitive abilities were not so much undeveloped as unused, pushed on one side by over-active phantasy. When they were used, they were often superior in quality (some of these children had high I.Q.'s). It was not that the child was unable to perceive, remember, think, respond verbally; but that his perceptions and memories were inaccurate, his thinking proceeding from false and unreal premises, associatively rather logically directed, his speech fluent but incoherent. Thus his verbal responses were apt to resemble a description of a dream (see particularly Hazel M.'s description of her free construction on p. 8), and showed that the child had little contact with objective reality. Instead of manipulating his phantasy material by means of cognition, he was subordinating his cognitive abilities to the dictates of 'self-active' phantasy.

But there were other cases in which for some reason or other the child was unable to express his phantasies. In extreme cases the child seemed to be suffering from a state of all-round inhibition, so that his general behaviour was unusually timid or constricted. His verbal responses in the experimental situation were brief and stereotyped, enumerative or designatory, and perseverative; and he was sometimes unable to respond at all. He produced few inventions; and his constructions were unoriginal and carried out with difficulty. But in other cases there seemed to be an overflow of energy into overt activity, either voluntary—in running about, playing games, etc.—or involuntary, in restlessness, overmovement, inattentiveness, etc. In the latter case, the main characteristics in the experimental situation were perfunctoriness or incoherence of response. The child was too restless and inattentive to observe or remember accurately, and any sort of answer that required little effort was produced. Inventions were few and banal; there was much repetition, sometimes of rather childish expressions such as "all wiggly-woggly". In the incoherent cases, speech seemed to be one of the forms of overt activity suffering from over-movement and lack of control. But in the case of Alan R., quoted on p. 13, expression of phantasy was not completely lacking. It was narrowed down and centred about a single situation—the inability to escape from danger.

Lastly there were those cases in which energy seemed to be confined to cognitive activity; in some cases to intellectual activity, in others to perceptual and verbal activity. But the latter were quite unlike those of Alan R., spontaneous and voluble. They were slow, laboured, careful, exhaustive and even repetitive. In other words, the child was not using his energy in free verbal activity; but seemed to be using it in overcompensation, to force his cognitive functions up to a higher intellectual level, one which he was unable to reach naturally, if at all. Thus a younger or less intelligent child such as Jean B. (p. 11), might aim at meticulous accuracy and exhaustive detail in observation and description. An older and more intelligent child, if of a rather timorous disposition, might show the strain in his apologetic attitude in responding to the meaningless designs; he was unable to perceive and describe them accurately, but would not dismiss them as incomprehensible. If he was of a more aggressive type, he projected this inability to perceive and understand back on to the 'silliness' or bad draughtsmanship of the presentations. In any case, lack of power to express phantasy was shown by the fewness of inventions in Exp. A. In Exp. B the free constructions were either themselves perfunctory and restricted, as with David D.; or showed that the child was restricted and unable to indulge in free activity, as with Lorna W.; or remained undeveloped, childish and incoherent, as with Jean B.

This brings us back to the divergences in the form and content of phantasies which occurred in certain of the maladjusted children. As demonstrated in the inventions of Exp. A, it might be abnormally slight in quantity and banal in content, i.e. too greatly dominated by cognition; or it might be abnormally frequent and luxuriant, and unlinked to reality. Thirdly, it might contain references to emotional states and activities, or emotion-provoking objects, which were more exaggerated and more 'unreal' than is normal in children of this age. As demonstrated in the free constructions of Exp. B, there were similar possible variations. Thus the constructions might contain few figures, selected and arranged with difficulty, representing familiar scenes containing little or nothing that was inventive. They might contain very large numbers of figures arranged with the wild incoherence of the little child, or in segregated or unrelated groups. Since the possible variations were numerous, the type of content threw much light on the emotional problems which the child was representing in symbolic form: the wild animals attacking or being attacked; the segregation of groups of people or animals from each other; and particularly the position of children, protected by adults or segregated from them or surrounded by wild animals, etc. In contradistinction to this, the normal stage of adult development in making such constructions is to produce a single unified whole, what we should term 'a picture', in which the various figures are related to, and their arrangement determined by, some single, verbalized concept. No child was able to reach this stage unless his cognitive abilities had matured sufficiently for him to use them actively in selecting elements from the contents of his phantasies, and in synthesizing these, before they were expressed with cognized material in an integrated whole which was consistent with his knowledge of objective situations in the real world. Clearly this must have involved a parallel process of subordination and control of phantasy, so that the latter was no longer 'self-active' as in the little child, and in the maladjusted older children described above.

Finally we may advance the hypothesis that the essential difference between the childish phantasy and the adult imaginative process consists in a shift of the unifying principle. In the childish phantasy this latter is the gratification of the instinctual self; and so it remains in the adolescent day-dream. But the adult imaginative process or interpretation is centred about some objectively cognized situation existing outside the self; and the self and its wishes operate indirectly or secondarily, if at all, in determining the course of the process. Now it is only in the very young child that *perception* seems to be a function mainly of processes within the self. From quite an early age the percept is at least referred to the external world; that is to say, the individual believes that it results from situations external to himself, and that therefore it obeys the principles of external causality. Moreover, as the child grows older he obtains an increasingly accurate knowledge of these principles; and by the time he has reached the age of nine or ten he is thoroughly familiar at least with the commoner ones. Thus in children of this age, such as we have described in this paper, there is a hiatus between perception, with its external reference, and the self-centred and self-determined phantasy.[1] And it is only when the individual has gained the ability to project the centre point or unifying principle of his phantasy away from himself, to give it an external reference and modify it in accordance with his knowledge of external reality, that phantasy and cognition can be fully coordinated about the same unifying principle in imaginative interpretation. Thus we might hazard a guess that the maladjusted child is retarded in this form of development because he is unable to detach his phantasy from his own ego. Since he cannot project it outwards into the external world, it cannot be directed and developed in accordance with his knowledge of external reality. The gap between cognition and phantasy remains, phantasy retains its 'magic' quality and true imaginative interpretation cannot develop.

The observations described in this paper present several aspects of this incoordination of cognition and phantasy. They are less instructive with regard to the fully coordinated imaginative interpretation, which by the very nature of its complexity and subtlety is difficult to investigate. Consequently the hypothesis advanced of the detachment of phantasy from the self and its outward projection is unproven, and requires further work for its demonstration.

V. SUMMARY

1. When a child is shown fairly complex pictorial material and asked to "tell me about it", he will, when quite little, respond enumeratively, that is, with a string of names of objects represented in the pictures. By the age of about seven, the normal child is able to give simple descriptions

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[1] In the 'inventions' produced in Exp. A, hesitation, resulting from the ambiguity of the external presentation, occurs between objective perception and subjective phantasy.

of pictures, which gradually become fuller as his age increases. Irrelevant detail is suppressed, and the actions and emotions of the people depicted are inferred and described, in what we have called partial interpretation. But it is not till the child is eleven or older that he is able fully to understand the picture and interpret it as a whole.

2. When the child is given fuller opportunity of expressing phantasy (in spontaneous invention in response to semi-diagrammatic meaningless designs, or in free construction of a picture with cardboard figures), a similar process of development is observed. With quite little children, at what has been called stage A, invention and construction are incoherent and apparently without meaning. Either the child's phantasies are too incoherent for him to be fully aware of them; or there is too great a segregation between phantasy and cognition for the employment of cognitive techniques in the expression of phantasy. With children of seven and upwards, at stage B, phantasy inventions appear in the child's responses to meaningless material, differentiated more or less clearly from what he perceives in the objective situation. In free construction, segregated groups of figures show in various forms the lack of integration between phantasy and cognition. Finally, at stage C, by the active use of cognitive abilities, cognitive and phantasy material are synthesized into a single, unified imaginative interpretation or construction; this does not occur until eleven years of age or more.

3. In children whose natural development has been retarded or distorted by lack of intellectual development, poor health or physique, or emotional disorder, the above stages are modified in various ways; and the child may be unable to reach the final stage of imaginative synthesis.

(*a*) The cognitive functions may be impaired. The child, unable to cognize in the manner normal at his age, attempts to regress to a more childish mode of expression. He does not as a rule show consistent simple enumeration, but more often compound enumeration (the names being qualified to some extent) or 'designation' (a brief naming of what he takes to be the subject of the picture); these are accompanied by perseveration, stupid invention and failure to respond. Phantasy seems fairly normal, though the expression of it is rather banal.

(*b*) Phantasy may be over-active, so that the child's mind seems to be dominated by it, and his contact with reality impaired. Inventions are very numerous, containing much description of emotion, movement and colour; they are 'magical' in character, and occur in the responses to meaningful material. Free construction is also over-elaborate and dream-like, showing exaggerated 'self-active' phantasy.

(*c*) The child may be lacking in ability to express phantasy. In some cases his energies seem to be entirely dammed up, so that he is inert, constricted, unable to respond except in a very brief and stereotyped manner. In other cases his energy seems to flow over into overt activity: into spontaneous physical activity, great volubility, or general restlessness and over-movement. Here the experimental response is perfunctory and poor in quality, although in voluble cases it may be considerable in amount, and very incoherent. Finally, the energy may be forced and canalized into certain forms of cognitive activity, particularly intellectual or verbal. In the former, responses are intelligent, accurate, objective and sometimes severely critical. There is little invention, and free construction is limited. In the latter, they are exhaustively detailed and meticulously accurate, but usually quite unintelligent; and free construction may show phantasy to be in as incoherent a state as that of a little child.

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APPENDIX

The Tachistoscope

For Exp. A it was necessary to use a tachistoscope which was portable, and which could present pictures of a reasonable size clearly and instantaneously, and also easily, without necessitating rigid fixation and monocular vision (since it was to be used with children). Moreover, it was desirable to avoid any distracting noises and changes in brightness of the field.

The apparatus is seen in longitudinal vertical section in Fig. 3 and in cross vertical section (at right angles to the line of sight) in Fig. 4. The pre-exposure field E_1 was a white rectangle, 5 × 4 in., with a black cross in the centre of it. It was illuminated by light passing through the aperture A_1 from the lamp L_1. Light from E_1 was reflected from the tilted plate glass M (see dotted line in Fig. 3) through the aperture A_4 to the subject's eye. The pictures, etc., to be presented were slid into the slot at E_2, the exposure field. This was illuminated by light passing through the aperture A_2 from the lamp L_2. Light from E_2 passed by direct transmission through the plate glass to the subject's eye. The brightnesses and optical distances from the eye of E_1 and E_2 were equal, and their optical images coincident.

E_1 and E_2 were illuminated alternately in the following manner: The arm R_1 of the shutter $S_1S_2S_3$ was pivoted upon and could move about an axis at P_1. Another arm

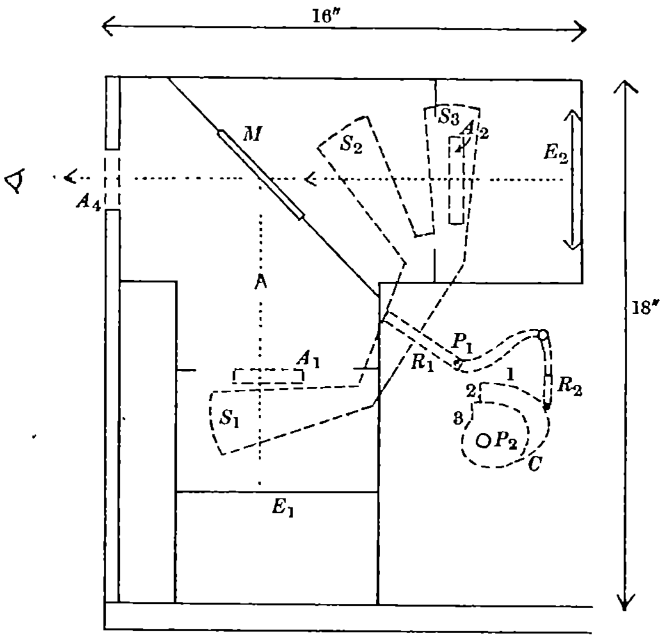
16″
M
S_2
S_3
A_2
E_2
18″
A_4
A
A_1
S_1
R_1
P_1
1
2
3
R_2
P_2
C
E_1

Fig. 3.

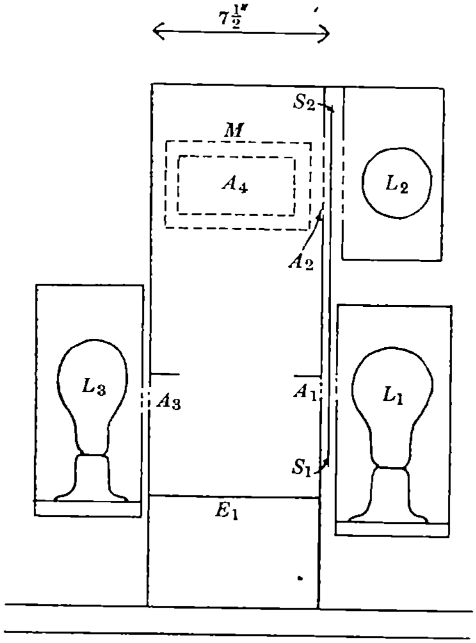
$7\frac{1}{2}$″
S_2
M
A_4
L_2
A_2
L_3
A_3
A_1
L_1
S_1
E_1

Fig. 4.

R_2, rigidly connected to R_1, moved upon the cam C which rotated at uniform speed about P_2. During pre-exposure, R_2 was at position 1, A_1 was uncovered, but A_2 was covered by S_3; during exposure, R_2 was at position 2, A_1 was covered by S_1, and A_2 was uncovered; and after exposure, R_2 was at position 3, A_1 was uncovered and A_2 covered by S_2.

Between each exposure, while the cam and shutter regained their zero positions, and R_2 regained position 1, the main circuit was switched off, and a subsidiary circuit switched on to the lamp L_3; this illuminated the pre-exposure field through the aperture A_3. When the cam was once more in position 1, the secondary circuit was switched off and the main circuit switched on. This alternation was carried out instantaneously by means of a rocking mercury switch.

The cam was driven by an electric motor. The length of exposure could be varied from 1·0 to 3·5 sec., by (1) altering the relative positions of the two parts of the cam by swivelling them about each other, (2) varying the speed of the motor.

A chin rest was provided so that the subject could place his head in a convenient position for looking straight through A_4. But it was not really necessary, and in fact the children often did not use it.

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THE CONCEPT OF THE 'SCHEMA'

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PART II.

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VI. THIRD EXPERIMENT, ON THE DIFFERENCES IN REMEMBERING WHICH OCCUR WHEN CHILDREN LEARN BY PARTICIPATION OR BY INSTRUCTION

(i) *General purpose of the study*

IN the first two experiments certain circumstances under which schematic differences arose were investigated. It was found that, "what the child makes from given material" varies with the difficulty the material has for him, and with his own characteristics, such as age and social experience. This experiment investigates the differences occurring in remembering when the learning methods themselves are devised to allow the child more or less freedom in "making the material his own". In one case learning, following the pattern commonly called the 'project' or 'enterprise' method, allows the child to deal with the material in his own way, and according to his own interests and understanding. In the other case learning, following the pattern of the 'drill' or 'instruction' method, is directed by the teacher. The teacher, in this case, attempts to convey to the child the items he wants him to remember, and the form in which they should be retained. This experiment investigates what differences in remembering actually result from these two methods of learning. We are interested in discovering what schematic differences, if any, result from them, and how these are related to the amount remembered of the actual given material.

(ii) *Relation to education*

While this study is concerned primarily with the schematic differences arising in these two cases, the experiment has a very real significance for educational theory and practice. Typical of the new philosophy of education are these statements which appear in the new programme of studies for primary schools in Ontario:

> Information which is interesting and useful is retained in virtue of its interest and use, not in virtue of its having been crammed for an examination.... What is necessary, if we wish children to retain "facts" is not to require that they be memorized but to clothe them with interest and provide opportunities for their use ((10), p. 10.).
>
> The purpose of the...activities is not the amassing of knowledge in neat lists and summaries but the development of interests and the forming of attitudes. It is to be expected, however, that *each child out of his own interested activities will learn more facts and better facts to add to his personal fund of information than he would be memorizing ready made second-hand information* (My italicizing) ((10), p. 59.).

In reading these statements, the close relationship between the philosophy underlying them—that interested activity is the basis of learning—and Bartlett's theory of remembering, is apparent. It is also apparent that these statements are based on psychological assumptions rather than upon experimental evidence. The claim made in these quotations—that the child "will learn more and better facts" when "they are clothed with interest and given opportunity for use" than when they are simply memorized—forms an important part of the problem we are investigating in this experiment.

From the above discussion the purpose of this investigation may be summarized in this way. Given these two methods of learning (which may be described as 'interested activity' and 'memorization', or as participation and instruction, or as the project and drill method) we attempt to discover:

(1) By which method "more and better facts" are remembered;

(2) What differences result in the way in which the child is able to use these 'facts'; that is, what does he do with what he has learned?

(iii) *General method*

In conducting this experiment it was attempted, in accordance with Bartlett's method, to avoid artificiality as much as possible. While Bartlett attempted to obtain reality by using material as much as possible "like that with which the subjects would actually deal", in this experiment the reality was extended to make the setting and procedure as close as possible to those commonly found in the school. The school principal, with whom the nature and purpose of the work were discussed, described the experiment to the teachers as an attempt to evaluate different methods of learning and explained the outline of procedure to them. This was followed by detailed typed instructions for each part of the experiment. The whole investigation was conducted in the school as a study based on the children's own interests rather than one having outside scientific implications.

(iv) *Outline of the experiment*

The pupils in three classrooms, A, B and C at Grade 5 were subjects. These groups, according to school standards, were considered approximately equal in their educational achievements. Their scores on verbatim recall tests after a preliminary reading were secured; and the 'project' method was adopted by the weakest group.

(*a*) *Material.* Two contrasting selections were used. One was a gay, lively poem which educationalists believed to be full of interest for the children.

Don Durk of Dowdee

Ho for the pirate Don Durk of Dowdee!
He was as wicked as wicked could be,
But oh, he was perfectly gorgeous to see!
The pirate Don Durk of Dowdee.

His conscience, of course, was as black as a bat
But he had a floppety plume on his hat
And when he went walking—it jiggled—like that
The plume of the pirate Dowdee.

His coat it was crimson and cut with a slash,
And often as ever he twirled his moustache
Deep down in the ocean the mermaids went splash
Because of Don Durk of Dowdee.

He kept in a cavern, this buccaneer bold,
A curious chest that was covered with mould,
And all of his pockets were jingly with gold!
Oh, klink! went the gold of Dowdee.

It's true he was wicked as wicked could be
His sins they outnumbered a hundred and three,
But oh, he was perfectly gorgeous to see!
The pirate Don Durk of Dowdee.

The second was a prose selection *King John,* which was considered badly constructed, confusing and dull.

The Magna Charta

John, the brother of Richard I, now became king. He was a bad king in every way. He was cruel and greedy, untruthful, boastful, and cowardly. In the beginning of his reign, he was guilty of the murder of his nephew Arthur, who was the son of his elder brother, and therefore the rightful heir to the throne. This led to a war with France, and by the year 1204 John had lost Normandy and most of the other provinces which had belonged to his father.

John continued to oppress his subjects in various ways in order to obtain money, and treated those who opposed his wishes with great cruelty. The people bore with John's bad ways for a long time; but at last they resolved to put a check upon his actions by making him sign a Great Charter, in which were drawn up a set of laws which would bind him to rule justly for the future.

The great barons, headed by Stephen Langton, Archbishop of Canterbury, took the lead, and all the people joyfully supported them.

The meeting took place in a meadow at Runnymede, on the Thames. It was a bright June day in the year 1215 when John, accompanied by a few of the nobles, rode down to the place from the neighbouring castle of Windsor. When the famous roll of parchment was spread out before him and read over, he did not waste any time, but carelessly took up the pen and signed it, and then set his seal to it. His heart, however, was full of rage; and as soon as he got back to the castle, he threw himself on the floor, and gave vent to his anger in terrible oaths and threats.

The most important provisions of this Great Charter were the following: (1) no one was to be wrongfully imprisoned; (2) no money was to be taken illegally from any one for the King's use; (3) justice was to be properly administered. But the great men who had drawn up the Charter knew that the faithless King who had signed it could not be trusted to keep his word; so they appointed twenty-five of their number to see that the wise laws which they had written down were properly kept.

His wicked life, however, was shortly afterwards brought to a close. In crossing the sands of the Wash with his army, the tide came in so suddenly that all the baggage wagons, with the stores and money, and even the crown jewels, were swept away. He took this loss so much to heart that he was seized with an illness; and a few days afterwards the people of England heard without regret that the tyrant was dead.

(*b*) *Procedure.* Different methods of learning were adopted by these groups:

Group A. This group learned by repeating the material, and being instructed in it by the teacher. The children were not encouraged to ask questions or discuss it. This will be referred to as the 'drill group'.

Group B. This group learned the material by repetition combined with class discussion and verbal participation. The teacher tried to connect it with interests and facts already established.

Group C. This group learned the material by dealing with it in the various ways they suggested—drawing pictures of it, making a play of it, etc. In their supplementary reading periods they were allowed to find reference material which would help them. There was very little 'drill' used. This will be referred to as the 'project group'.

The experimental procedure was as follows:

These groups were classroom groups composed of about 40 children. The learning periods were equated in half-hour periods.

Don Durk

1. Thursday. Teachers read the poem through twice. Immediate reproductions were obtained.
2. Friday. The groups learned the material by the three assigned methods.
3. Monday. Pupils were asked to "write a story, pretending you are Don Durk and that you are sitting at home telling your friends of yourself and your adventures".
4. Tuesday. Pupils were asked to "write down all you can remember of the poem about Don Durk. Use the actual words of the poem as much as possible."
5. Wednesday. The poem was read through twice; the children followed it on mimeographed copies. A verbatim recall of the poem was obtained.
6. Thursday. An objective recall test was given.
7. Three and a half weeks later the objective test was repeated.

King John

(Given a week after *Don Durk* had been learned)

1. Thursday. The selection was read through twice; the pupils followed it on mimeographed copies.
2. Friday. The groups learned the material by the three assigned methods.
3. Monday. Pupils were asked to "write a story pretending you are one of the barons who is telling his children of the things he and his friends did during King John's reign".
4. Tuesday. The selection was read through twice by the teacher and group and a verbatim recall test was given.
5. Wednesday. An objective recall test was given.
6. Three and a half weeks later the objective test was repeated.

(v) *Analysis of results*

Two methods were used in analysing the results: (1) The results were analysed to show the amount of the actual material the children had mastered. This was done by verbatim recalls and objective tests. (2) A study was made of what the children did with the material when given a free setting to use it. This was obtained by asking for stories based on the general thought of the given selection.

(1) *Quantitative differences*. These were measured in terms of the scores obtained on verbatim recall and objective tests.

With *Don Durk*, verbatim recall scores were obtained from all groups after the preliminary reading, three days after the learning period, and immediately after a short, supplementary drill period. In scoring these recall tests, the poem was divided into seventy-three 'idea-units'. A chart listing each of these idea-units was made and each time one of them occurred in the children's recall it was scored. By this means a graph was obtained which showed, not only the total amount recalled by the group, but the relative degree each idea-unit was remembered. Differences in the amount each part was remembered can readily be read from group to group.

Objective recall tests were obtained a day after the supplementary drill period and repeated three and a half weeks later. In part 1 the subjects had to check on a list of twenty-four nouns the ones which came from the poem, and in part 2 specific questions about the poem had to be answered.

In the verbatim tests the amount recalled by the group is given as a percentage of the total amount the group could score if each member of it gave every idea of the poem. The objective tests are given in terms of the average of the individual scores. Table I shows these results.

Table I. *Scores on verbatim and objective tests obtained by three groups learning a poem by different methods*

	Group A	Group B	Group C	Average
Verbatim tests (group scores as percentages of total possible score)				
1. Preliminary test	29·7	33·3	23·6	28·9
2. After learning	57·5	50·7	30·6	
Increase from 1	27·8	17·4	7·0	
3. After extra drill	84·8	77·9	70·9	77·9
Increase from 2	27·3	27·2	40·3	
Increase from 1	55·1	44·6	47·3	
				Possible score
Objective tests (averages of individual scores)				
1. Immediate test				
Part 1. Wrong	0·6	0·5	0·4	12
Right	10·9	11·3	10·8	12
Part 2. Questions	10·3	9·5	9·5	12
Total	20·6	20·3	19·9	24
2. Remote test				
Part 1. Wrong	—	0·9	0·5	12
Right	—	10·6	10·7	12
Part 2. Questions	—	9·9	9·8	12
Total	—	19·6	20·0	24
Difference: Remote – immediate	—	–0·7	0·1	

From this table it will be seen that on the preliminary test, group C, scoring 23 %, compared with 29 % in group A and 33 % in group B, is the weakest; it therefore was used as the 'project' group. The scores obtained after the three methods of learning had been used show that group A—the drill group—with an increase of 27 %, makes the best progress, and group C, with an increase of 7 %, the poorest; group B's achievement is midway, the increase being 17 %. With the short additional drill period group C (gaining 40 % to 27 % of A and B) makes a greater increase in achievement than the other groups. The scores after the supplementary drill give A a 55 %, B a 44 % and C a 47 % increase from the starting point set by their scores on the preliminary tests.

It should be noted that although the increase in verbatim recall is least in the project group after the learning period, the short supplementary drill brings the achievement of group C to a standard comparable with the other two groups.

On the first objective test the average scores out of a possible 24 are, A 20·6, B 20·3 and C 19·9. On the test given three and a half weeks later the average scores are B 19·6 and C 20·0. Therefore, it may be said, that the three groups score almost identically on this test.

With *King John*, verbatim recalls were obtained after the preliminary readings and after the learning period with a short drill added. The objective test was composed entirely of specific questions. This was given one day after the drill period and repeated in three and a half weeks. Table II shows the results.

Table II. *Scores on verbatim and objective tests obtained by three groups learning a prose selection by different methods*

	Group A	Group B	Group C	Average
Verbatim tests (groups' achievement scored as percentage of total possible score)				
1. Preliminary test	24·8	23·7	18·2	22·2
2. After learning period and drill	38·4	38·6	34·9	37·3
Increase	*13·6*	*14·9*	*16·7*	
				Possible score
Objective tests (averages of individuals' scores)				
1. Immediate	16·9	18·3	17·4	31
2. Remote	14·4	16·0	15·3	
Difference: Remote – immediate	– 2·5	– 2·3	– 2·1	

Group C, scoring 18 % of the 104 units, compared with 24 % in group A and 23 % in group B, was again the weakest in the preliminary test. But the increase achieved on the second test by group C was 16 %, compared with 14 % in group B and 13 % in group A. The difference in recall of content among the groups is very slight. The objective tests also show no significant difference among the groups, the average scores being, A 16·9, B 18·3 and C 17·4, out of a possible score of 31. On the remote test the scores are A 14·4, B 16·0 and C 15·3. Therefore, it may be said, the three groups are almost the same when tested for the actual content of the selection.

Under the same conditions a great deal more of the poem which was shorter and more 'interesting' was remembered than of the prose selection. The difference is not great on the preliminary tests, the average of the three groups on the poem (Table I) being 28 % and on the prose (Table II) 22 %, but after the learning period the average on the poem is 77 % and on the prose 37 %. On the objective tests the groups score on the poem about 0·85 of the possible score and on the prose about 0·3. The prose selection is, therefore, evidently more difficult. Although the absolute amount of content achieved differs in the two selections, the three groups on both selections are closely similar in the amount they achieve. Group A makes slightly the best achievement score on the poem, 55 %, with B 44 % and C 47 %; and slightly the worst on the more difficult prose selection, the achievement score being 13 %, with B 14 % and C 16 %.

Summarizing this discussion of quantitative differences, when results of verbatim and objective tests on both selections are considered, the differences in achievement of the actual material by the various groups is very slight. One method of learning achieves approximately as much of the content as another. One specific difference which may be noted is that when the group which has learned by the 'project' method is tested before the material is presented as a whole again, the achievement is considerably less than that of the other groups. A short additional period of 'drill' on the material brings this group to the standard of achievement of the other groups. This point, which has great pedagogical significance, will be expanded in a later section.

(2) *Qualitative differences.* Next, a qualitative analysis was made of what the children did with this material, when they were given a 'free' setting in which to use it. The children were asked to write stories (see procedure, p. 26). The directions were framed in such a way that the children could use the given material, expand it, or use material from other sources, objective or imaginative.

In reading the stories, differences among them were quite apparent. Some were highly imaginative, others merely repeated the given material, some were well organized, others confused. To show these differences several methods of analysis were attempted. Three will be mentioned here. Of these the first two may be considered rough attempts to locate the differences, which are more clearly brought out in the final method.

The poem as given has no temporal or spatial setting. It might be about a pirate at any time and in any place. A temporal or spatial setting indicated by "one day", or "when I was on the sea", is something the child has developed in his story, himself. The number of children in each group who give either or both of these settings is shown in Table III. From this table we see that group A gives 18 settings, group B 39, and group C 54. Therefore, the more freedom in learning the children are given, the more they are able to give new forms (at least those of time and space) to the material.

Table III. *Number of pupils in each group giving a temporal or spatial setting to their story about Don Durk*

	Group A	Group B	Group C
Temporal setting	9	19	25
Spatial setting	9	20	29
Both settings	7	13	21
Total: Temporal and spatial	18	39	54

Indices of the amount of material from the poem and the amount of new material used by the child were obtained by counting the number of nouns in the stories which came from the given poem and the number of new nouns introduced. The average number of *old* nouns used by each group was A 9, B 6 and C 2. The average number of new nouns was A 4, B 7 and C 9. This, again, is an indication that the groups given more freedom in learning are less 'bounded' by the given material. They can use other sources in their stories and extend them to new situations.

The third method of analysis was to place each story into one of five categories. These categories were defined in terms of the extent to which the story was based on the given material and the extent to which it was constructed by the child. A description of each of the categories with an example of a story included in each is given below. Three of them contain stories which are constructed by the child and show originality.

Category 1. This contained 'stories' which consisted of nothing more than the poem in its original form. There is no difference between these stories and those obtained when a verbatim recall was requested.

Category 2. This contains stories modified only in change of pronoun. The poem is changed to the first person.

I, Don Durk of Dowdee,
I am as wicked as wicked could be,
My coat it is crimson, etc.... (Group A.)

Category 3. This contains stories which are based on the given material but items are added to it.

"One day I was on my ship and the waves were pretty strong. I would turrel my mustache and down west the murmads splash. Oh it was fun to see them. I had plume on my hat that wobeled like that because it was so dangley and wobeley so sometimes it would make me laugh. I had a buccanear chest covered with mould, that was full of gold. I stole them off other ships but we had to fight for them. I was bold and bad but people said I was gorgies to see. We fought many battles at sea and many of us got killed. I took all the pearls I could find and chestes I could find and gold that was aboard. I the pirate bold and bad was killed to death at sea." (Group A.)

Category 4. Stories here are predominantly the child's own, but there is little organization or direction in them.

"I sailed the water in 1917 on the Mayflower. I had forty men. We went and robbed the mercents boat of five million dollars. We saw police. We hid the gold and ran. I was caut and we ran abord our ship and got arms. We fout and won. We settled down till the gold ran short and I got a job in a gold Mine, I set a time and we robbed the Mine and saild for Spain but ended up in England. Say it's one oclock. I must go now Sam and gang lets rob the safety bank tomorrow and divide the spoil and sail to Spain so long." (Group B.)

Category 5. Stories in this category are 'made up' by the child but the direction and organization is more definite than in category 4.

"I guess I'll tell you boys a story. Well as the ship pulled up her anchor and sailed of, I took a nice long nap. And I slept two days and two nights and then I woke up on the 2nd of June. And when I woke up I saw we were of the coast of Africa and were unloading the guns and amunition. And as we were doing this a British gunboat attached us. Well the battle lasted three days and we had took the sailors prisoners and we were going to make them walk the plank when Butch came along and said he saw a fleet of destroyers comıng towards us full steam and were firing ten inch shells at us, so we hoisted our anchor and started sailing away full speed towards home and we reached shore just in time. We had sprung a leak so we jumped off the ship and ran to the fortress and here I am safe and sound."

Bull: "Gee what a story! That'll make a swell story book." (Group C.)

The number of stories written by each group are shown under the category to which they belong, in Table IV. The total number of stories belonging to the first three categories are, A 24, B 9 and C 2. The number belonging to the last two categories are, group A 11, B 29 and C 38. In the groups given more freedom in learning, there is less adherence to the form and content of the given material, more facility in relating it to material from other sources and greater organization into new forms and settings.

It should be noted that although these stories use new settings and contain nouns not found in the given material, they are never irrelevant

Table IV. *The number of stories developed by each group from* Don Durk, *which belong to one of five defined categories*, 39

	Group A	Group B	Group C
1. Poem	1	1	0
2. Poem changed to first person	16	4	0
3. Poem with additions	7	4	2
Total, based chiefly on given material	24	9	2
4. New story	2	9	4
5. New story (good plan)	9	20	34
Total, determined chiefly by the child	11	29	38

to the general theme—namely "piracy". This fact can be made apparent in this way. We gave each story a title. Selecting five titles at random from each group, the following list is obtained.

A	B	C
Getting the Boat	Sea Adventures	Exploring
Confused Sea-Battle	Planned Ships Robbery	Sea Battles
The Wealthy Ship	How the Pirate was Robbed	Dangerous Sea Life
Tragic Whaling	Showing off the Treasure	What Don did
Stealing the Chest	Don Durk's Life History	Robbery and Storm

Thus it is indicated that the children did not make up just any story—they centred it around piracy, the sea, battles and so on. There is a relationship with the general outline of the given material, not with the specific content.

The stories developed about *King John* were categorized in the same way.

Category 1. This contains those stories which are verbatim reports of the given selection.

Category 2. These are stories written from the viewpoint of a baron but including only material from the given selection. The change of pronoun is the main innovation.

Category 3. Stories heavily dominated by the given material, to which the writer adds material, or forms the story to include the baron as a real participant in the plot.

Category 4. Stories are included here which show the child's interpretation, and use of material from other sources.

Category 5. Stories which extend the topic to include other events and which maintain a definite viewpoint and good organization throughout.

It should be stressed that demarcation between the categories is not in any way absolute; the first three include stories based largely on the given material, while the last two include those which show a new point of view, new material and new interpretation of the given material.

The number of stories in each category are shown under the three groups in Table V. This table shows that the number of stories dominated by the given material are 36 in group A, 31 in group B and 20 in group C. The number which show predominantly the influence of the child are, A 0, B 6 and C 19. This table shows the same general trend as Table IV. The groups given more 'freedom' in learning extend and augment the given material into new forms; moreover, they are able to maintain a new point of view in their story and use the given material in the new setting.

Table V. *The number of stories developed by each group from* King John, *which belong to one of five defined categories*

	Group A	Group B	Group C
1. Selection	3	7	6
2. Selection modified to first person	31	18	5
3. Selection with additions	2	6	9
Total	36	31	20
4. New interpretations	0	4	13
5. New interpretation with good plan	0	2	6
Total	0	6	19

Summarizing the discussion of qualitative differences, these three methods of analysing the stories show that the more opportunity the children have to participate in learning along lines of their own interest, the less bounded they are by the form and content of the given material. The ones given more freedom in learning can use the material in new ways, relate it to other material and re-construct it in new forms much more satisfactorily than the ones who were drilled on the given material. From this experiment the following conclusions may be drawn:

(1) Approximately the same amount of the actual material is remembered by all groups. However, when the children followed their own interests in learning, a review of the material as a whole was necessary in order to raise their verbatim recall score to the level attained by the other groups. We may conclude that children learn as many "facts of the given material" by the 'project' method of learning as they do when they memorize it by 'drill'.

(2) What the children made from the material becomes apparent in examining the differences which occurred when the children were given a

new setting in which it might be used. The procedure of setting a task which may be approached in many ways has been shown, in this experiment, to be a valuable method for focusing the "schematic differences in remembering". It was found that with more freedom and participation in learning, the schemata are less controlled by the given material, more adaptable to a new point of view, and more individualistic. When learning is based on definite instruction, the schemata reflect the material as it was given, and are stereotyped.

We may summarize these findings in this way: when learning is directed by the child's own interests, he not only achieves as much of the actual material, but is able to extend it into new forms required in other settings much more effectively than when the learning is based on instruction by the teacher.

The meaning we have given the concept of the schema, in earlier experiments, is supported and clarified by this experiment.

VII. INTERPRETATION

(i) *The meaning of 'schema'*

At the beginning of this thesis the place of the concept of the schema in Bartlett's theory was described. The confusion resulting from his many uses of the term and the sources from which it developed were discussed. From experiments which studied remembering as an active process, an interpretation of the term was made. It has been used to designate "what the subject makes (creates or develops) from the given material (or situation)". This use does not coincide with any of Bartlett's four uses; schema is not used as a force, a subjective form, content or an apperceptive mass. It does, however, correspond very closely to the notion which we mentioned was pertinent to Wardian psychology:

> What is really retained is a kind of schema, a *plan of action*. ((6), p. 9.)

This thesis, using schema to mean "what the subject makes", may, in other words, be said to use it as the plan of the activity, the pattern of the subject's remembering, or "the form in which material is re-created". It, therefore, is appropriate to Ward's psychology and to Bartlett's theory of remembering.

According to Ward "experience is becoming expert by experiment". Learning in this psychology is therefore experience. Learning is a continual process. As a process it cannot be examined directly. At any instant a cross-section of the existing relationships can be examined. When this is done it is found that the learning has 'form'. This form of learning is what we mean by schema. Learning not only has form, however; it has also direction. This cannot be obtained by examination at one instant. But a subsequent examination at a later instant will show a change in the schema. This change of form of schema from one examination to another may be the clue through which direction is understood. The schema influences learning, therefore, only in so far as form at one instant influences what form of relationships will evolve at a second. Learning and remembering are dynamic but their dynamics can only be inferred from various static photographs and the evolution of the schema gives a means of insight into the dynamic process itself.

When remembering is thought of as an active reorganizing process, the amount of given material which appears in the reorganization can, of course, be studied. We have suggested one method by which the other aspect of remembering—namely, what the reorganization is like—may be approached. This schematic aspect has important psychological significance both theoretical and clinical. Rather than the quantitative differences, the schematic differences—differences in what the individual has formed from his past experience, differences in the plan his activity takes—are of primary importance to the educator and to the psychiatrist. To be able to appraise what an individual makes from a given situation, enables one to know the interpretation he gives it and the significance it has for him, and this knowledge is necessary both for adequate clinical therapy and for satisfactory educational direction of the type desired in progressive educational philosophy, especially as it is embodied in the new *Programme of Studies* (10).

(ii) *Significance for education*

In a philosophy of education the ultimate aim of which is to fill the individual with a great number of disparate facts, hoping rather vaguely that sometime, by some process of association, they may become related, a psychology and methodology of the Ebbinghaus type is sufficient (7). The only aim of experimentation is to find the relationship between the number of facts which are given and the number which can be reproduced.

When education becomes interested not in the number of facts but in how the individual organizes and uses them, a psychology based on the notion that the activity of the individual is organizing in its very nature is necessary. Bartlett's psychology, which emphasizes the reorganizing activity of the individual is highly pertinent to such a philosophy of education. A method within this psychology for studying reorganization is, of course, required. The meaning we have given to the concept of the schema in this thesis forms a basis for such a method, and its value has been tested by using it in examining reorganization in the practical educational field.

If our philosophy of education is based on the individual differences of children, and learning is directed along lines set by their individual needs and interests, appraisal can be made only in terms of what the individual actually achieves. Achievement can be only individualistic and considered relative to the child's abilities and interests. The notion of the schema suggests a means of evaluating what the child is achieving and, therefore, makes possible appraisal of the extent to which education is approximating its goals.

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DRAWINGS OF A MAN BY ADOLESCENTS

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I. INTRODUCTION

In 1924 I began an investigation of children's drawings, and a first report was published in the *British Journal of Psychology* in 1931 (7). The investigation was completed in 1935, when a second report was prepared. In view of certain criticisms, however, publication was held up until I had had an opportunity of seeing the reports of other investigators working on this or allied subjects. The recent publication of Oeser's translation of Lowenfelt's *The Nature of Creative Activity* (5) seemed to make a suitable occasion for the revision of my own report.

The purpose of the investigation was the preparation of an objective method of examining children's drawings from the psychological and not the scholastic standpoint. At first the method used was that developed by Earl Barnes (1) and later by McCarty (6). This was to state a theme and to allow the children to illustrate it in any way they chose. The variety of interpretations was, of course, considerable, and the drawings were marked by comparison with standard drawings.

That seemed insufficiently objective and I had begun experimenting with a more specific subject—a man—when Goodenough's *Measurement of Intelligence by Drawing* (4) was published. She, too, had used this subject and had devised a scale of rather more than fifty points. Most of the early work in my own investigation consisted in trying out her scale with children in Aberdeen, Glasgow and Greenock. I came to the conclusion that her norms for American children were satisfactory for use in Scotland. The Goodenough scale is applicable to children up to 10 years of age. It is extrapolated up to 13 years. I formed the opinion, however, that the scale was not satisfactory for young adolescents, and it was with them that I was chiefly concerned for vocational guidance purposes.

In 1928, an opportunity for extending the study to cover young adolescents (10–14 years of age) presented itself in the National Institute of Industrial Psychology's Fife Experiment in Vocational Guidance (2). It was arranged that each of the 430 pupils should make a drawing of a man. The drawings were sent to me for marking. Later I discussed my interpretation of the drawing scores with Mr J. Kilgour, who was conducting the experiment, in the light of his experiences with the children and the impressions which he had formed of their personalities. Reference was also made to the children's other test results.

With the coming of adolescence, the child's drawing of a man undergoes considerable change and, at first sight, there may seem to have been deterioration in quality. Confidence has been lost; for instance, the line is now indecisive, and parts which are difficult to draw, such as the hands, are sketchily treated or omitted. But, although obvious features are lost and there is a falling off in logical arrangement, a subtlety previously absent may take their place.

The loss of confidence is largely due to the child's realization that his drawings are not good. He may have been told so many times but now he perceives the imperfections. Eventually, as he comes into closer contact with, and finally a part of, a new environment, he finds that the drawing game is not played by his associates. He knows that he is not good at it and he gives up playing. After a few years he may maintain that he has "never" been able to draw, that it is a "splendid gift", and that he has "always envied people who can draw". Often, when he says that, he does himself less than justice.

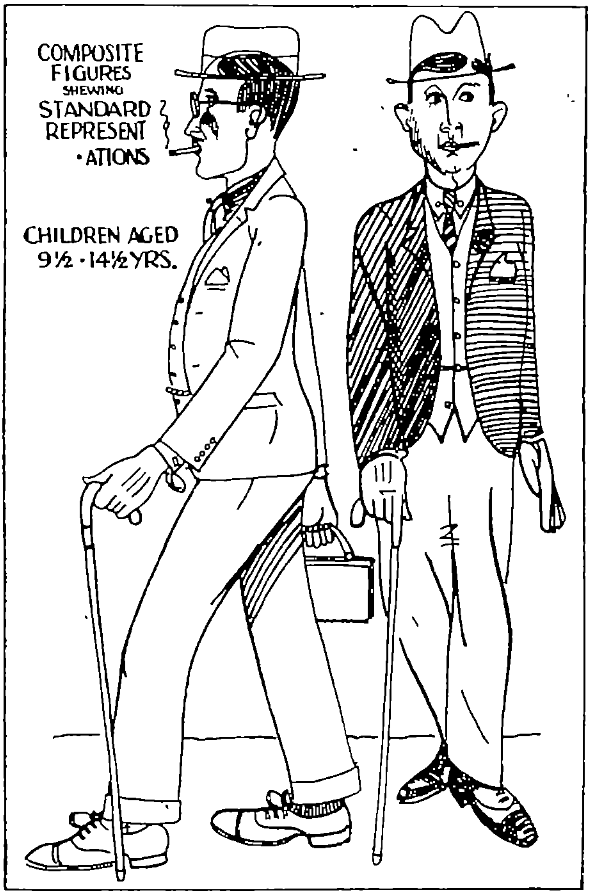

COMPOSITE FIGURES SHEWING STANDARD REPRESENT·ATIONS
CHILDREN AGED 9½·14½YRS.

Fig. 1.

II. Preparation of the drawing scales

(1) *The points of the scale*

Two composite figures (Fig. 1) were prepared showing all of the items upon which it was thought points could be based. Three scales were prepared. The first followed the Goodenough scale fairly closely, and had fifty points. The intention had been to ascertain every possible way in which each selected detail could be drawn, and then to group together those representations which had been used by the children who made the better drawings. It was found, however, that most good and bad representations were each of one kind, and other representations were so few in number, and so varied, that they did not lend themselves to statistical analysis. For the second scale a standard representation (for profile and for full-faced) was used for each point, and subjective judgments were made when deciding which of the other representations were and were not to score.

The fifty points were reduced to twenty in the preparation of the third (or final) scale. The other points were rejected for various reasons —some, such as the proportion of the size of the head to that of the trunk, seemed to be regarded by the adolescent as of little importance; some, such as the drawing of the hands, to which reference has been made already, were evaded by the adolescent because of the difficulty of making them life-like; some were scored by almost everyone and some were scored by almost no one; and in some cases the requirements of scoring had become so complex that I could not see how to state them clearly in a few words.

Twenty points may be considered too few for a standardized test. But this limited number makes for more convenient and perhaps more accurate marking. My difficulty was not, however, to find out how to reduce fifty to twenty points, but to determine twenty points, which, after they had been tried out and critically examined, could be considered reasonably satisfactory. I had hoped to arrive at twenty points, each of which would be scored by approximately the same number of persons. This did not materialize, and, while the distribution of points of the final scale, if arranged in order of difficulty, does give a linear curve, it has a marked gradient. Although the 'Standard Representations' are, in practice, of little importance, since other representations also score, they have been retained largely because they are useful when the scale is being memorized. All of the other representations may be regarded as modifications of the standard.

(2) *Full-faced drawings*

One of the greatest difficulties I experienced was to establish a balance between profile and full-faced drawings. Semi-profile drawings are rarely seen (0·4 %). Most of the drawings made in the immediate pre-adolescent years are profiles. During the first adolescent disturbances, there is a tendency to revert to the full-faced drawing of the pre-6½ year age group. (Of all the drawings made by boys, 13·2 % were full-faced, and of those made by girls, 20·3 % were full-faced.) The quality of the full-faced drawing was usually inferior to that of the profile—particularly in the representations of the features of the face itself—but it is admitted that the final scale does tend to exaggerate the difference.

Before discussing the points with which the final scale has been formed, reference should be made to two other lines of enquiry followed during the investigation.

(3) *The coefficient of eccentricity*

When it was realized that some points were being scored much more frequently than others, the use of weighting was considered, but the distribution of the points did not suggest suitable groupings. It seemed that a measure of the degree of unusualness, exhibited by each child in the points which he scored, might be both interesting and useful. In some of the drawings, for instance, the total score, though small, was made up of points, such as numbers 14, 7, 19 and 20, which are rarely scored. In other cases a total of nine or ten was obtained in a quite orthodox way.

Accordingly a coefficient of eccentricity was used. For each drawing the number of *b* points scored (nos. 1, 2, 7, 9, 11, 14, 18, 19, and 20) were separated from the other or *a* points. The coefficient was the fraction, *b*/*a*. A high coefficient—over 0·60—indicated that there had been a considerable degree of unusualness in the way in which the points had been scored.

(4) *The index of adolescent disturbance*

An attempt was made to calculate an index of adolescent disturbance but it was not successful. This is, however, a useful approach to problems of adolescence, and to investigators who may use it in the future I pass on the following observations:

(1) The proportion of the height of the figure to that of the sheet of paper upon which it is drawn seems to have significance. The size of the sheet used in this experiment was 8 by 5 in., and distribution of the heights is shown in Table I.

Table I

in.	Boys %	Girls %
Up to 1	0	0
1–2	2·8	2·4
2–3	14·2	12·6
3–4	31·4	28·4
4–5	26·1	31·3
5–6	17·3	18·3
Over 6	8·2	7·0

The very small drawings made by some children are suggestive of lack of confidence, and this might be attributed to adolescent disturbance.

(2) The sheet of paper is sometimes turned so that the centre-line of the figure runs approximately parallel to the shorter instead of the longer side. I found this to be uncommon (occurring in less than 2 % of the drawings), and am inclined to regard it as more closely related to introversion than to adolescence. Possibly it has aesthetic significance.

(3) The drawing is sometimes left unfinished (there is no time limit in the test) and legs or arms—generally legs—are omitted. Detail is frequently quite absent except in the face, the figure being no more than an outline. The tendency, noted by Goodenough among younger children, to concentrate upon one part at the expense of the others, is common among adolescents. The face usually receives most attention. The index I used of the size of the head was that it should not be more than one-half or less than one-quarter the area of the trunk.

(4) Noticeable features of adolescent drawings are twisted and stunted hands and fingers; and twisted, stunted or elongated, and very thin arms.

(5) The omission of the sleeves might have significance—the break at the cuff-line is not shown, and the hand is not separated from the arm. The hand itself may be omitted.

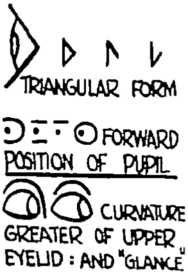
(6) The omission of the collar, or, indeed of any line at the neck separating the head from the body, is also an interesting feature of some drawings.

(7) The lines tend to be indecisive, sketchy and broken in comparison with those of younger children.

III. THE SCALE FINALLY ADOPTED

(1) *Description of points*

No. 1. *The eyes. Requirements for scoring: profile—either triangular form or forward position of pupil. Full-faced—either curvature of upper eyelid greater than that of lower eyelid; or 'glance'.*


TRIANGULAR FORM
FORWARD POSITION OF PUPIL
CURVATURE GREATER OF UPPER EYELID : AND "GLANCE"

The triangular form used in profile drawings is appropriated directly, in my opinion, from drawings printed in books and periodicals. Many black-and-white artists try to represent facial details with as few lines as possible, and the omission of the lower eyelid is among their commonest devices. This simple angular form is probably adopted by most of the children because it 'looks right', and without an attempt being made to find out *why* it looks right. Generally, the upper and lower eyelids are shown as symmetrical. The term 'glance' used in reference to the full-faced representations is self-explanatory (Fig. 2 (5)). Sometimes there are squints, the glances in the two eyes not being identical. The examiner has then to decide whether glance is really intended, or whether an accidental effect has been obtained by bad drawing. In some instances the decision is influenced by the general impression formed of the whole figure. "Is this a child likely to include glance?" The outstanding difficulty in marking point 1 is deciding when the pupil is in 'a forward position'.

Point 1 was scored by 26·0 % of the boys, and by 31·6 % of the girls. Of the full-faced drawings, 10·5 % of those made by boys, and 12·3 % of those made by girls scored the point.

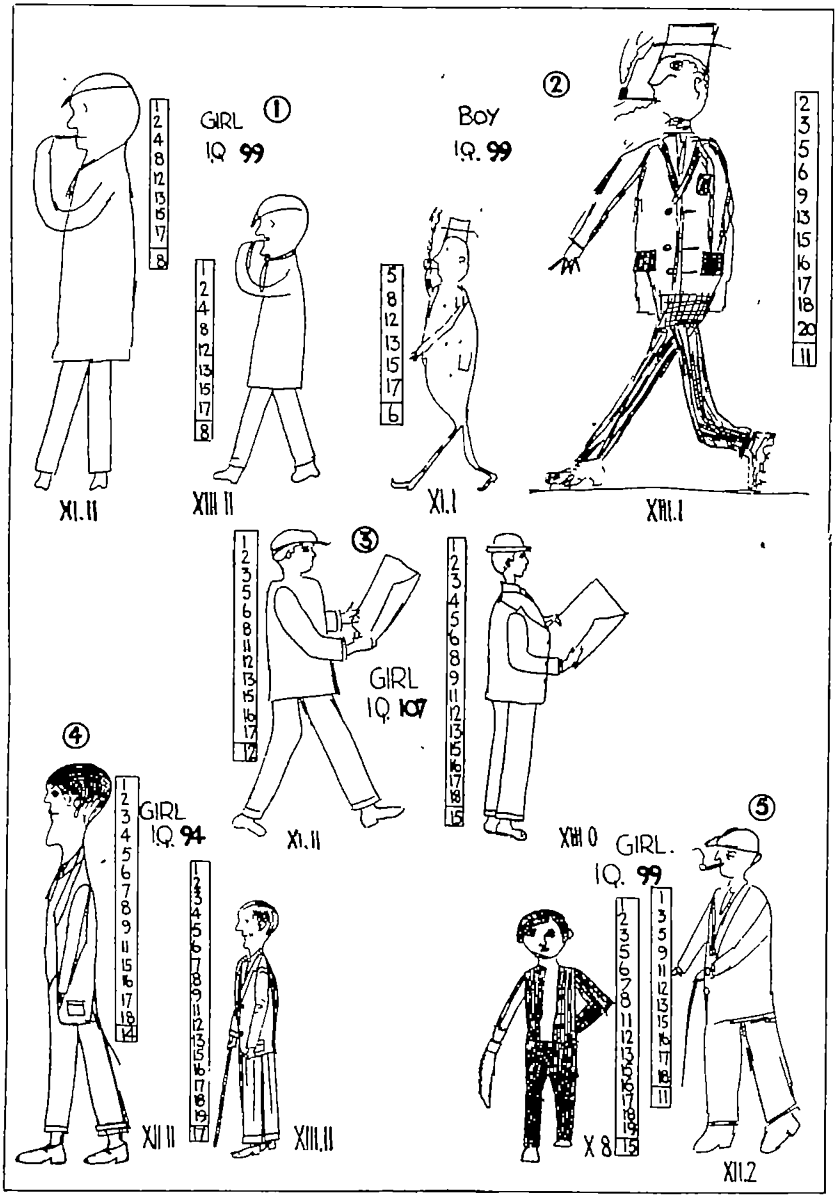
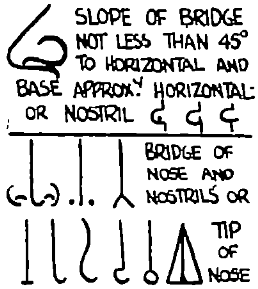


Fig. 2. Drawings of 'a man' made by five pupils after an interval of approximately two years. The points scored and the total scores are shown for each drawing. (Drawings reduced to 0·37 of original height.)

No. 2. *The nose. Profile—either slope of bridge of nose not less than* 45° *to horizontal, and base approximately horizontal; or nostril shown. Full-faced—bridge of nose and either nostrils or tip of nose shown.*

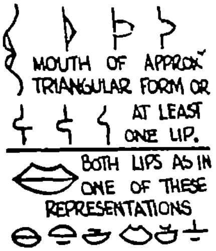

SLOPE OF BRIDGE NOT LESS THAN 45° TO HORIZONTAL AND BASE APPROX.Y HORIZONTAL: OR NOSTRIL
BRIDGE OF NOSE AND NOSTRILS OR
TIP OF NOSE

All details of the face, with one exception, were difficult to mark, and there was the further complication that in the full-faced drawings the facial details are more frequently scamped than in the profile drawings. This point was particularly troublesome. The maximum angle of the bridge of the nose to the horizontal was at first fixed at 80°; with a permissible range (12° above horizontal and 30° below horizontal) for the slope of the base of the nose. A comparison was also made between the area of the nose and the area of the face as a whole. Normally a human being's nose is approximately the same shape as a 60° set-square. But variations in shape and in size are so considerable that the examiner sometimes has to deduce from the manner in which the rest of the drawing has been made, whether, let us say, a peculiarly aquiline form—possibly resembling a beak rather than a nose—is deliberate or merely fortuitous (Fig. 2 (3)). Finally, the conditions were considerably simplified. Possibly it would have been better to have abandoned altogether the reference to the shape of the nose and to have substituted a requirement about the line of the base of the nose continuing inwards from the outline of the face (Fig. 2 (2)).

It was found that requirements for scoring the full-faced representation were no easier to devise. The flat triangular form was rejected—although I know that there actually are such noses—except when the bridge was shown too. The tip (or the base) of the nose may be shown in many ways, and the drawings have been treated generously (Fig. 2 (5)). The peculiar *w* and *m* bases were scored when the bridge also is included—they are probably relics of the decorative treatments found sometimes in the drawings of younger children.

Point 2 was scored by 26·7 % of the boys, and by only 16·3 % of the girls. Full-faced drawings in which this point was scored were made by 26·3 % of the boys, and by 27·2 % of the girls.

No. 3. *The lips. Profile—either the mouth of approximately triangular form or at least one lip shown. Full-faced—both lips shown as in one of the representations on this page.*


MOUTH OF APPROX. TRIANGULAR FORM OR AT LEAST ONE LIP.
BOTH LIPS AS IN ONE OF THESE REPRESENTATIONS

Most writers of papers about children's drawings have commented on the careless way in which the mouth is drawn. Indeed, in this instance, the representation chosen as the standard was reproduced in fewer than 1 % of the drawings. Lips are rarely shown in the profiles (Fig. 2 (4)) and, after the drawings had been marked for the first time, it was realized that the inclusion of lips could not be made the only condition for scoring and that another and more easily satisfied requirement must be used. This accounts for the inclusion of the opening of the mouth.

A profile representation which should not be allowed to score is that in which the outline of the face from the nose to the chin is a straight line, the mouth being inserted later by one or more short dashes. Even after this had been excluded, however, the modified requirement for the point was now so readily met—and sometimes by representations which could not be considered at all good—that, when preparing the final scale, I seriously considered discarding the point altogether and substituting another, such as the inclusion of eyebrows.

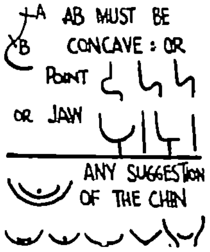
As, however, the lips provide a satisfactory item in the marking of full-faced drawings, the point was retained, with conditions as they now appear in the scale. The only difficulty met with in the full-faced representations is caused by smudged lines made when badly sharpened pencils are used. It is occasionally impossible to make out any of the details.

This point was scored by 63·0 % of the boys, and by 67·1 % of the girls. In the full-faced drawings 33·3 % of the boys and 30·9 % of the girls scored.

The differences between the percentages for the profile and full-faced drawings are marked and this is one of the weaknesses of the final scale.

No. 4. The chin. Profile—chin between lips and point concave; or point or jaw shown. Full-faced—any deliberate indication of chin scores. A beard or other device obscuring chin does not score.

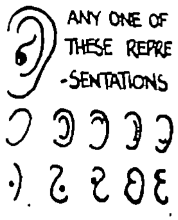
Difficulties in marking this point are also caused by the use of soft, unsharpened pencils, and by the minuteness of some of the drawings. The requirements that the curve *AB* shall be concave is searching. But if I had to prepare another scale, I should experiment with a combination of the point and the jaw. Indeed, the original conditions have already been broadened to include these features, but they are more suitable for the profile drawing than for the full-faced drawing.



The point was scored by 36·7 % of the boys, and by 47·5 % of the girls. It was less frequently scored in the full-faced drawings—by 19·3 % of the boys and 9·9 % of the girls.

No. 5. The ear. Any one of the representations shown on this page scores.

Requirements to be met in scoring this point were comparatively straightforward. The first was simply that there should be an ear—it is astonishingly frequently missed out. The minimum amount of detail which could be considered satisfactory had also to be determined. Within my experience the lobe and the concha have been shown only very rarely by young adolescents (a fraction of 1 %) in, at least, a recognizable form. The entrance to the auditory canal—the 'earhole'—appears in rather more than 8 % of the drawings and the outer 'curl' of the auricle is shown by means of a double line in approximately 15 % of the drawings.

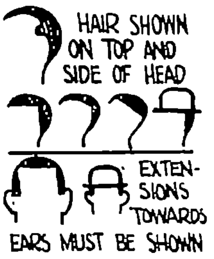


The inclusion of any one of these details was allowed in scoring the point. A reasonably good attempt to shape the outline of the ear was also recognized and for this the essential requirement was an approximately triangular shape with a fairly acute angle at the lobe. Some of the attempts to represent this oddly-shaped organ are amusing, and I dealt with the '3' and the '*S*' forms generously (Fig. 2 (2)).

The representations of the ear made by the children in the profile and full-faced drawings are very much alike, but it is interesting to note that the point is less frequently scored in the latter. Perhaps the simple outline of the full-face, as compared with the greater complexity of the profile-face, leads to a scamping of details.

The point was scored by 43·4 % of the boys, and by 39·7 % of the girls; but in the full-faced drawings alone by only 31·5 % of the boys and 21·0 % of the girls.

Nos. 6 *and* 7. *The hair. Point* 6—*hair covering top and part of side or back of head. Where hat is worn, the point is scored if hair is shown between hat and ear. Point* 7—*hair represented as brushed by means of directed lines with perhaps a suggestion of shading by tone. Scrawl does not score.*



In many drawings the men are quite bald (Fig. 2 (2)), and in only a few is an attempt made to represent the hair by any other means than dots, dashes or scrawl. The sketchiness of the drawing and the absence of outline makes the marking of point 6 more difficult than may be expected.

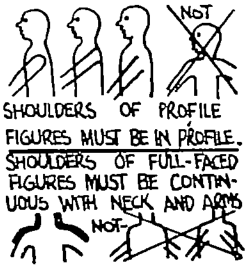
The point was scored by 43·2 % of the boys, and by 57·8 % of the girls. In the full-faced drawings there was again a considerable—a very considerable—fall in the numbers of children scoring the point—17·5 % of the boys, and 32·1 % of the girls.

When scoring point 6, I dealt with the drawings generously but, for point 7, I dealt with them quite severely. The amount of attention given by different children to the drawing of the hair varies considerably. Some—5 %, mostly girls—make it the outstanding item (Fig. 2 (4)). Others show the hair in quite a pleasing way, two or three being 'slick' in the professional manner. The more painstaking children direct the shading and, by using solid black, carefully show the hair brushed and shining, with a clearly defined parting and possibly also a tuft at the crown.

Accordingly, in preparing the final scale, a point which was regarded as unsatisfactory in the second scale was replaced by a new point requiring the head to be not only well covered with hair, but with hair which had been brushed. The shading should be directed to follow the outline of the head.

I gave a score for this point to about 8 % of the drawings.

No. 8. *The shoulder. Profile—shoulders shown in profile. Arm must be represented by double line. Full-faced—shoulders continuous with neck and arms.*



The amusing incongruity of the double nose in the mixed profile, which characterizes the drawings of children from 6½ to 7 years of age, has tended to divert attention from the discussions on its significance. Although the head and the legs complete the turn from full-faced to profile during a comparatively few months, the trunk might never leave the front position (Fig. 2 (2)). The way of showing the shoulders in a profile drawing (i.e. a drawing in which the head and feet are shown in profile) provides, therefore, a very useful measure of the quality of children's drawings.

There is no corresponding distortion in the full-faced drawings (i.e. a drawing in which the head and trunk are shown in front view). Accordingly, another requirement had to be substituted, and it is that the shoulder should be continuous with the arm and neck.

The point was scored by 70·4 % of the boys, and by 69·6 % of the girls. In the full-faced drawings it was scored by 61·4 % of the boys, and by 64·2 % of the girls.

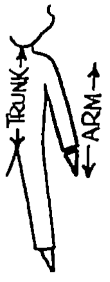
No. 9. *Lapels of coat. Lapel must be clearly defined and not open to confusion with collar. Collar does not score, not even in costumes.*

The lapel was originally just one of the many items included among the requirements for scoring points 17 and 18. But I soon realized that it had greater significance than most, and perhaps all, other details of clothing. In the final scale the lapel has been made a separate point, and the requirements for scoring have not given rise to difficulties. The only feature causing doubt is the occasional uncertainty as to whether the child intended to show a lapel or collar.

In costume drawings lapels would be sometimes inappropriate and their omission cannot be treated as a fault. At first, in these circumstances, the collar was allowed to take the place of the lapel, and a score given for its inclusion. This caused further difficulty, and I decided to mark the point severely, allowing a collar to score only when the accuracy of its representation and the treatment of adjoining parts suggested that the lapels had been left out deliberately.

The point was less frequently scored than one might have expected —by 20·9 % of the boys, and by 35·2 % of the girls. In the full-faced drawings it was scored by 21·0 % of the boys, and by 27·2 % of the girls. It will be noticed that the girls score this point (a detail of clothing) more frequently than do the boys.

No. 10. *Length of arm equal to or slightly longer than length of trunk; but not more than 1½ times its length.*



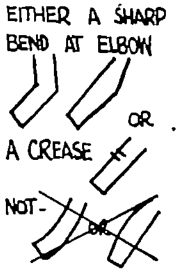
The relative sizes of different parts of the figure provide some very useful points in marking the drawings of young children; but they seem to have less significance in the drawings made by some adolescents. Until the preparation of the final scale, two points were retained based upon comparisons between sizes—the arms to the trunk and the legs to the trunk. The second of these was quite unsatisfactory. The conditions had to be made either so wide that almost all the children scored, or so restricted that the 'wrong ones' often scored when the 'right ones' did not. I think that the length of the leg is a very variable detail in the schema of an adolescent child's drawing of a man (Fig. 2 (2)). The legs are the last of the limbs of the body. Their length is, therefore, quite likely to be determined by chance. This criticism applies, although to a lesser extent to the relative lengths of arms and trunk.

The point was scored by 38·5 % of the boys, and by 32·7 % of the girls. In the full-faced drawings it was scored by 52·6 % of the boys and by 37·0 % of the girls.

No. 11. *The elbow. Either a sharp bend at elbow or a crease at elbow.*

The requirement for scoring this point is quite definite, although in practice some latitude has to be allowed in interpreting the word 'sharp'. A few cases have been credited in which there was no abrupt bend at the elbow, but the 'skeleton' lines from the shoulder to the elbow and from the elbow to the hands formed a distinct angle.

The point was scored by 29·1 % of the boys, and by 27·1 % of the girls. In the full-faced drawings it was scored by 26·3 % of the boys, and by 22·2 % of the girls.



No. 12. *The hand: action. Any activity with hands scores, including holding an article or two hands clasped together. The hands need not be well drawn. Arms parallel to sides or outstretched do not score, as they have probably been placed in these positions simply because they must be placed somewhere.*

The representation of activity in a drawing is important, a 'living' figure seeming to be psychologically more significant than a mere schematic form (Fig. 2 (5)). An exceptional feature about this point is that older children score it less frequently than younger children. Any kind of action is given a score but sometimes it is difficult to decide whether action has really been intended by the child. For instance, he has to put the arms somewhere, and figures standing at attention, or with outstretched welcoming arms, or with arms akimbo, or with downward stretched arms suggestive of despair, are merely formal and do not really signify action sufficiently clearly to score this point.

Requirements to cover all possible arrangements cannot be devised, and the examiner must sometimes make subjective judgments when scoring this point. Actually, however, there is only rarely serious doubt about a child's intention.

The point was scored by 33·5 % of the boys, and by 32·9 % of the girls. In the full-faced drawings it was scored by 26·3 % of the boys, and by 35·8 % of the girls.

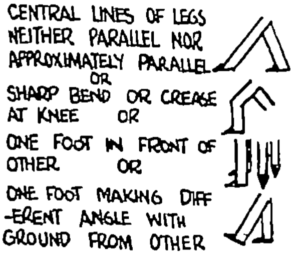
Nos. 13, 14, *and* 15. *The feet. Requirements for scoring points* 13 *and* 14 *are shown on p.* 49. *Requirement for scoring point* 15 *is any form of heel or at least one foot not in profile and foreshortening attempted.*

While the length of the legs is not considered to be an important feature of an adolescent child's drawing, the treatment of the feet has more significance. No less than three points have been allotted to it.

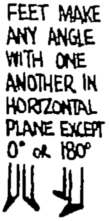
Point 15 requires no explanation, the importance of including the heel and showing the foreshortening of the foot having been generally recognized (Fig. 2 (5)).

Point 14 covers all variations of the usual 0° and 180° schema. Point 13 has been included to cover activity with the feet. Only 1 % of the children scored all three points, but the combination of points 13 and 15 is found in a considerable number of the drawings.

13.


CENTRAL LINES OF LEGS NEITHER PARALLEL NOR APPROXIMATELY PARALLEL
OR
SHARP BEND OR CREASE AT KNEE OR
ONE FOOT IN FRONT OF OTHER OR
ONE FOOT MAKING DIFF-ERENT ANGLE WITH GROUND FROM OTHER

14.


FEET MAKE ANY ANGLE WITH ONE ANOTHER IN HORIZONTAL PLANE EXCEPT 0° OR 180°

Various ways in which activity with the feet may be represented are shown above, and any one scores point 13. The options cover a wide range, but it will be found that they all apply to an activity with the feet. A few children qualify to score this point in more than one way (Fig. 2 (2)), but, of course, they are not awarded more than one point.

Placing one leg in front of the other is probably more significant than the other ways of scoring point 13. For instance, contrast the pairs of drawings (2), (3) and (4) in Fig. 2. The scale might have been improved by separating this, and making another point with it.

The number of children scoring the three points are shown in Table II.

Table II

	Boys		Girls	
No.	All drawings %	Full-faced %	All drawings %	Full-faced %
13	54·5	10·5	36·4	6·2
14	4·2	17·5	5·5	9·9
15	75·3	71·8	78·9	69·2

Point 13 was expected to favour the profile drawings, but point 14 was intended to restore the balance, and this has been to some extent achieved.

Nos. 16, 17, *and* 18. *Clothes. Point* 16. *Ends of sleeves* and *trousers clearly marked. Point* 17. *At least one of the articles mentioned below shown. Point* 18. *At least three of these articles shown.*

One, but usually not more than one, of the many clothing details associated with the basic schema is included by most children. They may be regarded as of trivial importance, or as bearing closely on the ideas which the children are trying to express in their drawings. These articles are: hat-band, parting in hair, eyelashes, spectacles, beard, moustache, cheeks (shaded), pipe, cigarette, tie, collar-pin, stud, watch-chain, cuff-links, cuffs, button-*holes*, handkerchief, trouser-crease, trouser turn-up, pocket, knot in tie, knot in shoe lace, sole of shoe (see Fig. 1).

The drawings may be classified according to the attention given to clothing and activity. There are six general groups, although this number does not cover all the possible subdivisions:

(*a*) Purely formal, no associated details of clothing and no activity: boys 32·6 %; girls 24·3 %.

(*b*) Purely formal in that there is no attempt to show either costume or activity, but a detail has been shown of a colourless character, such as a pipe, moustache, tie-knot or boot-lace: boys 28·4 %; girls 43·9 %.

(*c*) Purely formal in that there is no attempt to show *costume*, but there is orthodox activity to the extent of the man carrying something (generally a stick, umbrella, or bag), walking, running, etc.: boys 16·3 %; girls 21·7 %.

(*d*) As in (*c*), but attempt is made to show 'meaningful' activity (boxing, shovelling, etc.): boys 4·4 %; girls 3·8 %.

(*e*) Character (clearly defined: not merely, say, a beard) or costume, but without 'meaningful' activity: boys 13·9 %; girls 5·8 %.

(*f*) Character or costume and 'meaningful' activity: boys 4·4 %; girls 0·5 %.

The differences between the two sexes are most interesting. It must be said that, compared to the drawings made by the boys, those of the girls tend to be unimaginative. There are fewer character and costume drawings, and action rarely gets beyond carrying a stick or umbrella. This might mean no more, however, than that the subject of 'a man' is not well suited to girls, and that for them it should have been changed to 'a woman' or, better still, to 'a girl'.

As the children who focus their attention on the costume may take little interest in the figure itself, they often do poorly at some of the other points. The scale may deal with them a little unfairly. Another point was considered requiring the inclusion of *six* or more items of dress. But in making such allowances one encounters another difficulty. The details in costume drawings are not adequately covered by the list—there are clogs, shawls, daggers, etc. The preparation of a list to cover all of them is quite impossible.

The "ends of the sleeves and trousers" have been made the requirement of a separate point, and this has been, in my opinion, one of the most useful in the series.

The numbers of children scoring these points are shown in Table III.

Table III

	Boys		Girls	
No.	All drawings %	Full-faced %	All drawings %	Full-faced %
16	52·0	52·6	63·6	55·5
17	67·5	63·2	75·6	69·2
18	25·8	40·3	23·6	30·9

No. 19. *Shading: Creases. Shading by tone differences or by line direction on two adjacent parts, other than hair, boots, and background, to distinguish them from one another; or shading to represent shadow; or at least one crease in clothes or face.*

The use of shading to represent shadow is certainly worthy of recognition. An allowance for showing creases (Fig. 2 (4)) has been added to it. The crease is no less significant than the shadow, but one of its commonest appearances—at the elbow—has been already recognized. The requirements for points 11 and 19, as they are given in the scale, permit of its scoring twice.

It must be admitted that the decision to include creases in the requirements for point 19 was influenced partly by the fact that, in practice, the situation is rarely met. Appreciation of the use of creases usually goes with that of shadow, and the two are frequently found together in the same drawing. The crease seems to precede the shadow in development, but it is used with less skill. It is included, I think, quite often because it 'looks right' rather than because it is really understood.

Greater difficulty was experienced in deciding if a score should be given for shading when it represents not shadow but differences in tone—as, perhaps, between the materials of which the jacket and the waistcoat are made (Fig. 2 (5)).

No less than 3 % of the children use shading of this type, but sometimes its purpose is, very obviously, to hide deficiencies in their drawing. It is quite often employed by mental-defectives. A uniform light grey tone was placed over the whole or most of the figure by approximately 1 % of the children, possibly in an attempt to get a 'realistic' effect. This is one of the practices which seem to go by 'schools'—it is much more common in some than in others.

The conditions are severe, for details, such as the hair, the hat, and the boots with which shading is readily associated, are excluded. Few children succeed in meeting the requirements.

The point was scored by 11·4 % of the boys, and by 7·0 % of the girls. In the full-faced drawings 17·5 % of the boys, and 8·6 % of the girls scored the point.

No. 20. *Background. Any attempt, no matter how slight, to indicate background apart from the figure. The presence of a second figure of any kind is sufficient.*

Background (Fig. 2 (2)) is one of the most readily observable features of a drawing and its inclusion is recognized as important by all, or almost all, investigators.

Any form of background meets the requirements for this point, which was scored by 19·3 % of the boys and by 10·6 % of the girls. In the full-faced drawings 26·3 % of the boys, and 16·1 % of the girls scored this point.

(2) *What the scale is and is not intended to measure*

At this stage it is perhaps advisable to mention again what this scale is and, incidentally, what it is not intended to measure. The points are based upon characteristics and details which the young adolescent could have observed in other people's drawings of men and appropriated—for instance, a way of showing an eyelid or a crease. The points do not necessarily relate to the aesthetic merit of the drawings.

The ability to draw a man has to be acquired by the child. He is unlikely to be taught at school how to draw a man. Indeed, it is occasionally true to say that children learn to draw men in spite of their art teachers. I would emphasize this point because the general public does not realize that there are many different branches of art. The artists best qualified to express an opinion on whether a series of drawings has been fairly evaluated by means of the scale described here are cartoonists and magazine illustrators.

I have become accustomed to the surprise that this suggestion arouses and I have heard it lead to a discussion on whether a cartoonist is really an artist at all. That is, however, to miss the point completely. The question of whether it is desirable for children to copy the work of cartoonists is outside the scope of this paper. The point is that that is how they do learn to draw men.

This test is, accordingly, very different from tests based upon the treatment and content of children's drawings of imaginative subjects. Such tests afford opportunities for studying the gradual shaping of interests and ideas, particularly of pre-adolescent pupils, and I strongly advocate their use. The test of drawing a man is supplementary to them, or perhaps it would be more accurate to say that, for adolescents, they are supplementary to it.

It is a mistake, however, to apply the scale to the drawing of a man included in an illustration of a theme. A separate drawing must be obtained in which the child has focused his attention on drawing one particular man.

IV. ANALYSIS OF SCORING

(1) *Distribution of total scores*

The distributions of total scores are shown graphically in Fig. 3. There is a tendency, although not statistically significant, for the scores to be slightly higher for girls than for boys. The boys make more very bad and very good drawings than the girls do.

Regarding all of the ages 10–14 as forming one group, the scores may be graded as follows: 0, 1, 2 (i.e. up to 11 percentile) poor; 3, 4, 5 (up to 36 percentile) fair; 6, 7, 8, 9 (up to 67 percentile) average; 10, 11, 12, 13 (up to 91 percentile) very good; 14–20 excellent.

An examination was made of the possibility of obtaining correlations of the total scores with chronological ages, mental age being kept constant, but the material was unsuitable. It can, however, be said, as an indication, that the correlations were of a low order, generally little above zero.

(2) *Feminine characteristics*

The chief feminine characteristics I observed were:

The fine rather delicate line.

Attention given to shaping the outline. The figures sometimes have feminine contours.

Inclusion of greater detail, particularly of the face and of clothing.

Saucer-shaped eyes, too big for area of face.

Small noses. Comic noses, which are often seen in boys' drawings, are hardly ever seen in girls' drawings.

Greater attention to mouth, including perhaps 'cupid's bow lips'.

Hair drawn more carefully than in boys' drawings.

Arms and legs too thin.

Feet too small.

Very unreal representations of such masculine properties as beards and pipes.

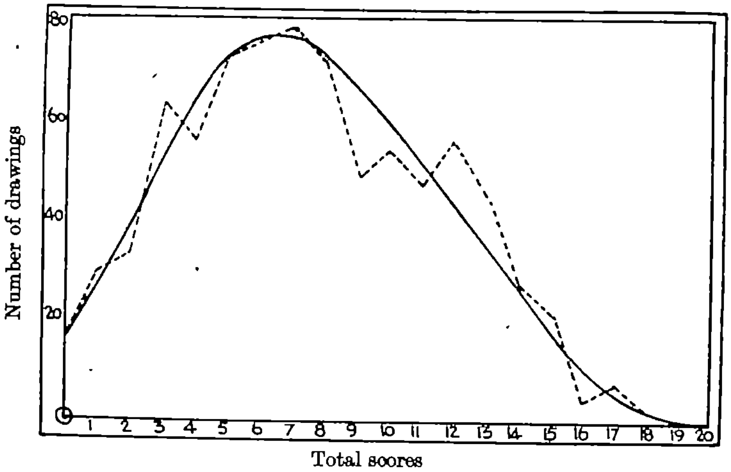


Fig. 3. Distribution of total scores. It will be noted that the reduction of the number of points to twenty has been responsible for some children scoring very low marks.

(3) *Differences due to different social environments*

Three of the six schools included in the experiment, A, B, and C, were in the country, and the other three, Z, Y, and X, were in the town (Dunfermline). The central three of the Registrar-General's five social classes were represented in the experiment. The children attending schools A and C came mostly from the homes of farm labourers in comparatively sparsely populated districts. The village B was more compact and, therefore, more of a community than were the other two villages. Further, it was situated near a fairly large and prosperous industrial town (Kirkcaldy). The children attending Z were drawn mainly from the professional classes. Those attending X were from the poorer classes and some of the parents were unemployed at the time of the investigation. The other school Y was more mixed. There was a prominent country element, the school being on the outskirts of the town. The fathers of many of the other children were tradesmen. The schools were to be ranked socially in the order Z, Y, and X.

The mean drawing scores and also the mean I.Q.'s for the boys and for the girls of these six schools are given in Table IV. In calculating these means, the *last* drawing score made by each child has been used. Thus the ages of almost all of the children come within the thirteen-year-old group.

Table IV

School	No. of children	Mean drawing score	Mean I.Q. (Binet)
A. Boys	19	5·47 ± 0·53	91
Girls	16	6·13 0·45	93
B. Boys	21	6·23 0·55	93
Girls	21	7·14 0·53	95
C. Boys	34	7·90 0·49	96
Girls	28	7·92 0·49	100
Z. Boys	41	10·63 0·38	109
Girls	48	10·58 0·33	112
Y. Boys	70	8·58 0·32	99
Girls	44	7·48 0·40	97
X. Boys	56	7·68 0·35	91
Girls	71	7·53 0·29	94

Although in each instance the number of children is small, the difference between the drawing score means of (Z) and those of the other schools, and especially the country schools, may be regarded as significant. The smallest difference between the means is for the boys of (Z) and (Y), i.e. 2·05. The P.E. of this difference is 0·50. Accordingly it may be said that the ability to draw a man is influenced by social factors —perhaps, simply that the drawing game is most often played and encouraged in the homes of fairly well-to-do people.

(4) *Coefficient of consistency, a measure of reliability*

As is mentioned elsewhere, there is a tendency, not quite general, for the total scores made when the test was done for the second time (usually after an interval of two years) to be slightly higher than those for the first attempt. Coefficients of consistency were calculated to show the extent to which the key numbers of the points scored in the first drawing were the same as those scored in the second. The coefficients were rarely less than 0·6.

V. OTHER AVAILABLE SCORES

One of the chief purposes of the Fife experiment(2) was to examine a large number of tests. It was begun in 1928 and was of six years' duration. The work of the first period of three years was mainly testing, and of the last three years mainly following up.

Some children were examined only once (those aged 13 years in 1928–9), others twice and a few three times. Generally there was a gap of two years between the first and second testing. As the experiment was limited to the group formed at the start, it followed that the 12- and, particularly, the 13-year age groups contained many more drawings than the 10-, 11- and 14-year age groups.

The correlations (by age groups) of the drawing scores and the scores obtained at certain other tests are given in Table V. The number of cases varies slightly with different tests on account of school-absences, and there are a few drawings for which I did not have any other test scores.

Table V. *Table showing correlations of drawing scores with performances at other tests*

(All correlations are positive)

	No. of cases	Mental age (Binet)	N.I.I.P. test no 34	Form relations	Memory for designs	Cube construction	Pictorial completion	Mechanical assembling
10 yr.–10 yr. 11 mo. (boys and girls)	35–39	0·23	0·43	0·15	0·12	0·22	0·06	*
11 yr.–11 yr. 11 mo. (boys)	86–88	0·39	0·38	0·39	0·51	0·32	0·24	0·25
11 yr.–11 yr. 11 mo. (girls)	80–90	0·44	0·50	0·38	0·47	0·25	0·36	0·16
12 yr.–12 yr. 11 mo. (boys)	95–97	0·60	0·50	0·58	0·59	0·35	0·50	0·40
12 yr.–12 yr. 11 mo. (girls)	94–108	0·70	0·58	0·55	0·60	0·40	0·42	0·31
13 yr.–13 yr. 11 mo. (boys)	172–180	0·39	0·38	0·38	0·49	0·21	0·38	0·18
13 yr.–13 yr. 11 mo. (girls)	151–162	0·59	0·55	0·41	0·53	0·37	0·34	0·31
14 yr.–14 yr. 11 mo. (boys and girls)	29–40	0·40	0·40	0·17	0·52	0·30	0·35	*

* Not given owing to markedly different standards required for boys and girls.

VI. INTERPRETATION OF SCORES

(1) *Abilities*

The correlations of drawing scores with intelligence are fairly high. Intelligence is certainly an important factor in determining the ability to draw a man. It is a mistake, however, to treat a drawing test (at least of the kind described in this paper) as a test of intelligence.

The I.Q.'s (Binet) of the pupils with very high drawing scores (over 15) were: 117, 116, 115, 112, 112, 110, 108, 108, 103, 94 and 89. Against this may be set children whose score was under 5 and whose I.Q.'s were: 127, 120, 118, 118, 116, 115, 115, 114, and 111. The position with children whose drawing scores were high (13–15) is: I.Q. over 120 (7 children); 110–119 (27 children); 100–109 (21 children); 90–99 (8 children); 80–89 (10 children).

The correlations with certain tests of visual abilities, notably memory for designs, are fairly high. This may be attributed simply to the feeling of confidence with which a person who is accustomed to draw frequently might approach such a test; or it may be regarded as giving some support to the theory of the existence of a 'visile' type.

(2) *Subjective and objective attitudes in drawing*

During recent decades much attention has been given, particularly by members of the German psychological schools (see Lowenfelt (5), pp. 130–48), to two distinct styles in art. Various terms have been used to describe them, such as Kühn's 'sensorial and imaginative'. One artist, it is said, tries to portray what is sensorially perceptible. He copies reality, imitates nature. The other artist tries to draw what is experienced inwardly and this leads him to adopt *inter alia* ornamental treatment. In the face, for instance, the eyebrows combined with the nose, and perhaps the eyes, lend themselves to ornamental representation, and, where facial expressions are repeated, fixed ornamental forms may arise.

The pupil who does well at a test of drawing a man is probably of the sensorial type, particularly if he does much less well at imaginative drawing. The children who took part in this experiment did not do any imaginative drawing, so I have no data available on this point. I did not lack, however, personal opinions about it, for the number of persons who have at various stages in this investigation told me that I was working along the wrong lines was quite large. Reference was made in their criticisms to exhibitions of children's drawings—often from Central Europe—which have recently been held in many towns. These delightful drawings are generally of the imaginative kind, vividly coloured in crayon. Once a teacher told me how surprised she was to learn that I did not like to be given a drawing made with a very soft pencil. That, she said, was just what she recommended her pupils to use. Usually, however, the criticism was directed at the supposed analysis of one small part of a picture to the exclusion of all consideration of the ideas expressed by the child, his symbolism, his harmony, etc. My explanation that the child was asked to draw only a man and not to develop a theme was rarely well received, and I am afraid that several of my critics still think that the real reason why I restricted the subject to 'a man' was to make the marking simpler.

(3) *Indirect social interests*

The imaginative drawing is much more suggestive of introversion than the sensorial drawing. There is, accordingly, an implication that the child, whose drawing of a man obtains a good score when marked by the final scale, is likely to be more extraverted than the child whose drawing is highly imaginative.

However, he is, as I see him, a rather unusual kind of extravert. His interest is clearly in people instead of in things, but he likes to make indirect contact with them. He likes to be present on social occasions, so that he may feel he is taking part, rather than actually taking part. If someone pleases him—perhaps a film star—he tries to draw her. If someone annoys him—perhaps a teacher—he attempts to caricature her.

Probably there are really quite a large number of extraverts who seek in various ways to make indirect rather than direct social contacts. Few apparently find drawing of use to them, for most give up the drawing game altogether. But some do not, and it is interesting to speculate as to why they continue to play the drawing game.

Perhaps the most remarkable feature of the pairs of drawings obtained in this experiment is the persistence of the schemas. Four of the pairs of drawings in Fig. 2 show that, after a period of two years, the young adolescent reproduces an almost identical drawing. These examples are in no way exceptional. This persistence is commoner among drawings of average or less than average quality than among the good drawings; but it is to be seen even in Fig. 2. It seems almost incredible that every time these pupils drew a man during the interval of two years they used the same schema. That is, however, the conclusion to which anyone who studies this collection of drawings must come.

This apparently means that, whatever may have been the original reason for the child adopting and developing his own schema, its repetition has become quite formal. Accordingly, I examined the possibility that the children who did the best drawings were actually 'showing off'. Their drawing of a man is perhaps their outstanding accomplishment, and when they display their skill they might be deriving satisfaction from the interest they arouse. Even when they are alone and repeat the drawing, they might be hearing again the praise which this ability has won for them. Accordingly, I studied what was known about the characters, abilities and accomplishments of the children who did the best drawings. I was fortunate in that observations on these points were given to me by Mr J. Kilgour.

Brief notes have been prepared on the twelve children who obtained very high scores at the drawing test. It will be noted that only one (case 3) is outstanding in any other respect—such as scholastic, athletic or social achievements—which would bring him into the limelight.

Case 1. Drawing subjects, a soldier and a grotesque clergyman. Cheerful and an easy conversationalist. "Free and easy." Inclined to be lazy. Member of a large and happy family. A dreamer.

Case 2. Drawing subjects, a Spanish Dandy, and a formal subject of a man standing beside a chair. Moody and has to be coaxed. Nervous when faced with difficulties. Suspicious. Tendency to be dramatic. Likes reading adventure stories. (Two years later he was said to have undergone marked changes during adolescence and to be now very extraverted.)

Case 3. Drawing subjects, a Spaniard and a formal subject of a man smoking. "Good at everything." Shy and retiring. (Two years later, was said to be "coming out of his shell" and to be more sociable. An increasing tendency towards conceit and display was also noted.)

Case 4. Drawing subject, formal. Unfortunately little was remembered about this boy, as he left school shortly after the experiment began. His father is a ploughman. The boy is now working in a country weaving factory.

Case 5. Drawing subjects, formal. Timid. Confiding. Flustered at examinations. One of the few children who read newspapers regularly.

Case 6. Drawing subjects, formal. Reserved. Submissive. Lazy, but ambitious. Very keen on drawing, but not considered by his teachers to be particularly good at it.

Case 7. Drawing subjects, a sentry and a waiter. Markedly extraverted. Very talkative. Likes entertaining his friends at his home. Snobbish. Reads considerably.

Case 8. Drawing subjects, a soldier and a Scotsman. Deferential and insincere. Shifty. Avoids answering and would not look examiner in face. Cheats, in spite of being good at class work. Unhappy home life. The only boy to say that he likes writing letters.

Case 9. Drawing subjects, formal and a cowboy. Does not fit in with the other boys. Seemed conscious that his social standing was lower than that of his companions.

Case 10. Drawing subjects, formal. Very neat appearance. Well behaved. Conscientious. Unpractical, unlike an older brother, and seems to have an 'inferiority complex'.

Case 11. Drawing subjects, formal (hair very carefully drawn). Very quiet. Poor conversationalist. Plays by herself. Artistic.

Case 12. Drawing subject, formal. Shy and attractive. Left district after doing only two or three tests, including the drawing test.

These cases illustrate the point brought out by this experiment that young persons who draw men very well tend to have their thoughts turned out to the world of social realities rather than into themselves. The chief exceptions seem to be Case 11 (although the careful drawing of the hair may be highly significant of extraversion) and Case 10 (although the inferiority complex may point to an attempt being made to live in the world of realities). The same tendency is to be found when the children with drawing scores 15–13 are considered. The nineteen children with I.Q.'s over 114 may be taken as an example.

Case 13. Attractive. Polite. Submissive. Easily flurried. Unpractical.

Case 14. Self-reliant. Cheeky. Hasty in answering questions. Ambitious and pushing. Not scholastic.

Case 15. Shy. Unpractical. Does much reading but is very matter-of-fact and, for instance, despises poetry. Another of the few children who reads newspapers regularly.

Case 16. Very popular. Modest. Submissive. Easily flurried. Ambidextrous.

Case 17. Active. Frank. Talkative. Recommended to choose a sales career.

Case 18. Very cautious. Old for his years. Illness has interfered with his schooling. Enthusiastic reader. Wants to be a reporter.

Case 19. Cheerful. Active. Excitable. Wants to do the test better than anyone else.

Case 20. Jolly. Markedly linguistic. Level-headed. Wants to be a nurse.

Case 21. Active. Self-conscious. Old for age. Has had to care for mother who suffers from sleeping sickness.

Case 22. Highest intelligence of all girls. "Not too scholastic and quite practical." Individualistic and superior. Quite talkative after encouragement.

Case 23. Quiet. Shy. Dependable. Answers questions freely.

Case 24. Mercurial but "head screwed on all right". Assertive. Appearance rather unprepossessing. Few friends. A dreamer. Wants to be a missionary.

Case 25. Frail. Frequently kept from school by illness. Timid and too submissive.

Case 26. Very popular. Mother a widow and lives in straitened circumstances. Entertainer at parties. Appeared much more extraverted when doing tests than three years later when she was visited in connexion with 'follow-up'.

Case 27. Very shy. Too conscientious. Submissive but independent.

Case 28. Chatty. Delicate. Vain and given to display. Enthusiastic reader of newspapers.

Case 29. Bright. Clever at repartee. Extremely sociable—if playing leading part. Recites at concerts.

Case 30. Co-operative. Easily flurried. Likes a prominent place, but prefers not to be first.

Particularly interesting are seven cases of children whose I.Q. is under 85 who obtained a high drawing score (15–13).

Case 31. Very small physically. Regarded by teacher as a borderline case. Difficult in conversation.

Case 32. Repressed. Lame. Family name German, and this led to unpopularity during the last War. (Subjects of drawings: "A father about to punish his son for hitting a wee dog", and a very smart Scottish soldier.)

Case 33. Unstable and unreliable. Well meaning. Unhappy home life.

Case 34. Chatty. Particular about appearance. Excitable. Thought not to do himself justice at intelligence tests.

Case 35. Keen to get on. Comes from practical and unbookish family. Father often unemployed. Mother of the "anxious, talkative type".

Case 36. Spoiled. Only child. Unwilling to work. Wants to be a children's nurse.

Case 37. Frequently absent from school and exploited by parents who require her to do too much household work. Already reading novelettes.

One wonders what repressions and emotional conflicts led some of these Fife children to become skilled at drawing a man.

VII. CONCLUSION

There seem to be grounds here for evolving a theory that adolescents who draw men well tend to be of high (but perhaps not very high) intelligence, to be 'visiles' in their thinking, to be extraverted (and perhaps extremely extraverted), to be greatly interested in their fellow-men, but to prefer to mix with them and to influence their behaviour by indirect rather than by direct contacts. Support may be obtained for this theory by reference to the characters of illustrators, cartoonists and other black-and-white artists who specialize in drawing men. It will be found that, with astonishing frequency, their adolescence was difficult, both shyness and ambition being marked at that stage, and that as they grew older they appeared to become increasingly extraverted, perhaps to such an extent that they now seem to be highly extraverted.

It should be particularly noted that the theory is not that *all* persons who may be described in this way are good at drawing men.

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THE SUBJECTIVE JUDGEMENT OF THE ELASTIC AND PLASTIC PROPERTIES OF SOFT BODIES

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I. INTRODUCTION

IN an earlier paper (1) it has been shown that the superiority claimed by certain craftsmen (skilled cheese manufacturers) in judging physical properties of soft materials by handling does not lie in any superior tactual acuity in distinguishing small differences in elasticity and viscosity, at least in the case of approximately solid substances like rubber and of very viscous liquids such as hard bitumens. That certain other factors, such as age, education and practice in routine testing, do influence the elastic and viscous 'thresholds' was also shown. It was further pointed out that two other factors would be of importance in defining the capacity of an expert to give consistent judgements about the firmness of a set of samples; first, his capacity to recognize properties which he has previously learned to associate with desirable or undesirable qualities in his materials, and secondly, the degree to which he is able to reproduce the joint movements involved in performing the test by handling, especially with respect to constancy of the pressure applied and the time of its application.

Thus, in comparing the firmness of two materials differing in elasticity, since the viscosity of such materials depends on the stresses applied and the deformations produced, a decision of firmness will depend on the conditions of the test, and in the case of the comparison of the firmness of an approximately elastic rubber cylinder with that of a purely viscous bitumen, reversals of judgement can be obtained by varying the time during which the compression proceeds. This reversal was anticipated on purely physical grounds, since for a viscous material the amount of strain produced by a given stress increases proportionately with the time of application, whereas with an elastic material the strain reaches its equilibrium value almost instantaneously. The longer the stress is applied, the more the viscous material will have yielded by comparison with the elastic body, and the former will therefore be expected to be judged as relatively softer. On the other hand, it might well be that the comparisons are not in fact made in this way at all, and in order to test this a few quantitative experiments were carried out.

II. Preliminary experiments

(1) *Description of experiments*

Two of the best subjects from the earlier experiments were selected[1] ($m\Sigma\rho$ and $f\Sigma\rho$). Each subject was given a series of pairs of cylinders (diameter 2·0 cm., height 2·5 cm.). In the first experiment one member of the pair was a bitumen cylinder of viscosity[2] $10{\cdot}7 \times 10^6$ poises, and the other one of a number of rubber cylinders of which the compression modulus varied from 0·78 to 1·41 × 10⁷ c.g.s. units. The subject was asked to squeeze the pair of cylinders on certain occasions with a 'high pressure' (P_H) and on other occasions with a 'low pressure' (P_L) for periods indicated by a metronome, short-time compressions (T_S) lasting for 0·5 sec., and long-time compressions (T_L) for 4 sec. The subject squeezed the samples twice, in time to the metronome, changed hands, squeezed twice again, and then gave a judgement for relative softness. The tests were done in a roughly thermostated water-bath at 20° C. P_H or P_L, T_S or T_L were taken in random order; and also the initial placing of rubber or bitumen in the right hand. Subject $f\Sigma\rho$, who is musical, was quite unworried by having to synchronize her movements with the metronome, whereas $m\Sigma\rho$, who is unmusical, at first found the procedure somewhat difficult. The latter subject, after a considerable number of experiments, commented on the difficulty of comparing such different materials as rubber and bitumen for softness, but both subjects were able to give judgements throughout.

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[1] The subjects were classified as follows (1):

m = male,
f = female,

age given in parenthesis.

Σ = scientific worker (σ was used in previous paper),
ϵ = university education,
τ = technologist (skilled cheese-maker),
ρ = routine analyst,
O = observer subject (vide p. 66).

[2] For explanation of this and other physical terms, see Appendix.

In a second experiment, a standard rubber cylinder of compression modulus $1·53 \times 10^7$ c.g.s. units was compared with bitumen cylinders varying in viscosity from $4·6$ to $19·8 \times 10^6$ poises.

(2) *Results of experiments*[1]

The results of these experiments are given in Table I.

It will be observed that, whereas for these materials the pressure exerted by the subject does not markedly affect the decision, the time

Table I

(*a*) *Constant bitumen*

Subject		T_L	T_S	P_L	P_H
$m\Sigma\rho$	B	30	3	18	15
	R	1	16	8	9
	I	1	13	6	8
$f\Sigma\rho$	B	31	9	20	20
	R	1	23	12	12
	I	0	0	0	0

(*b*) *Constant rubber*

Subject		T_L	T_S	P_L	P_H
$m\Sigma\rho$	B	25	7	16	16
	R	0	19	10	9
	I	7	6	6	7
$f\Sigma\rho$	B	24	15	18	21
	R	8	17	14	11
	I	0	0	0	0

B = number of tests in which bitumen was judged softer.
R = number of tests in which rubber was judged softer.
I = number of tests in which no distinction was made.

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[1] Described in brief in *Nature* (1940), CXLV, 425.

taken has a very marked effect. In comparing bitumen cylinders with a rubber cylinder of constant modulus there is, in fact, a considerable range of viscosities over which a reversal of judgement can be induced by means of an eight-fold variation in time of compression. The same is true when the viscosity of the bitumen is constant and when the compression modulus of the rubber is variable. It might have been supposed that since differences in moduli of rubber cylinders could be detected with three times the accuracy possible for viscosities of truly fluid bitumen samples (see (1)) there would be a marked difference between the range of moduli over which reversal is induced in the constant viscosity experiment, and the viscous range in the constant modulus experiment. This is not so, probably because the advantage in judging elastic materials lies in the fact that they can be judged statically, whereas viscous materials must be judged dynamically; and in the experiments described above, since one of the samples was viscous in every test, this advantage could not occur.

In comparing the firmness of materials which in fact also differ in 'spring', two factors have to be considered. First, the method by which the materials are handled, producing different sensory reactions; and secondly, since 'firmness' in such materials has variable dimensions (i.e. those of viscosity in the extreme case of a true fluid and compression modulus in that of an elastic solid), a decision has to be made as to how to interpret these dimensionally variable stimuli in terms of 'firmness' in each individual case. It is not at present possible to differentiate completely between the effects of these two processes.

III. EXPERIMENT ON THE EFFECTS OF TRAINING AND EXPERIENCE ON JUDGEMENT

The preliminary experiments described above suggested that a much larger-scale experiment should be carried out to study the effects of training and experience in the capacity of individuals to give consistent judgements of comparative firmness or softness of materials varying in 'springiness' as well as in firmness. For this purpose twenty subjects were selected to compare the firmness of eight synthetic materials.

(1) *Method of experiment*

Seventeen of the subjects did the test 25 times, one subject 24 times, and one 26 times. Owing to the outbreak of war one other subject was unable to complete the experiments. Subjects were given the eight samples and asked to place them on the bench in order of firmness, using any method preferred, except only that samples were not to be torn into pieces. After completing all the tests, subjects were asked for introspections as to methods of handling and a specimen test was done in which the method was carefully observed. In the experiments themselves subjects were not usually watched. The samples differed slightly in surface appearance, and in all tests, therefore, subjects wore dark glasses and worked in a poor light. Moreover, subjects were told that samples might change their appearance slightly from day to day as a result of handling. In a few cases, subjects were unable to distinguish pairs of samples, and these pairs were recorded as 'equal'.

A number of secondary factors, such as slight distracting influences in individual tests, differences in the temperature coefficients of the samples (taken as a group), alterations produced by over- or under-working, were recorded, but are not considered to have been of sufficient importance to be taken into account in the statistical analysis. Frequency curves were plotted showing the variation in the position allotted to all samples by all subjects for different temperatures. These showed only a very slight tendency for any sample to differ in temperature coefficient from the remainder.

(2) *Materials used in the tests*

As the technologist subjects were cheese-makers, it would have been ideal if we could have used cheese for the experiments. Unfortunately cheese changes its physical properties too rapidly, nor is it easy to obtain homogeneous samples of any size. For these and other reasons it was decided to make a material having viscous and elastic properties very similar to those of cheese, but this material was quite different in appearance and smell. These facts undoubtedly affected the technologists. However much the expert may be urged to base his judgements of cheese on the results of handling alone, he invariably finds great difficulty in keeping these judgements distinct from those derived from the other senses.

The samples were made by mixing rubber solution, vaseline and plasticine in varying proportions, and evaporating the solvent in the open air. Precautions were taken to ensure that the material should be as homogeneous as possible. The samples were made into cylinders weighing 222 g. each, height about 8 cm. and diameter 4·5 cm. These differed slightly in density and hence in volume. From time to time the samples were re-weighed, and, where necessary, made up to their original weights. Since the samples tended to become slightly firmer when left to stand, they were gently worked by hand each day before the beginning of the tests.

(3) *Experimental details*

No subject ever did more than one test per day, and after each test samples were roughly remade and left to recover for at least five minutes before further use. Samples were marked by inserting coloured drawing-pins one into each sample, the arrangement being changed each day. The two experimenters and one other subject (called O = 'observer subjects') knew the purpose of the experiment, were shown results as they accumulated and were able to follow their own progress. The experiment was not discussed with the remaining subjects until after all tests were completed. One of us (F.M.V.C.) handled the samples very frequently each day, the other (G.W.S.B.) less frequently. The third 'observer subject' had nothing to do with the experimental work.

(4) *Objective tests on the samples*

The aim of the experiments described in the present paper is concerned with the comparison of subjective judgements of firmness, and the relationship between these and objective data is at present only of secondary interest. It was not possible to cut up the samples during the experiment in order to make test-pieces suitable for objective measurements, but as soon as the main experiment had been completed, borings were taken from the samples and loading tests were done on an apparatus similar to that used for determining the compression modulus of rubber cylinders, described in the earlier paper (1).

Observation of the methods used by individual subjects, made on special tests after the main experiment was completed, made it possible to assess time (t) and pressure (p) scores for each subject. The t-scores (5, 4, 3, 2 and 1) corresponded respectively to quick jerky squeezing, rather quick squeezing, moderate, slow and very slow squeezing. Very few subjects continued a single squeeze for more than about two seconds. The pressure score corresponding to pressure exerted in squeezing was also assessed (p-score; 5 very hard, 4 hard, 3 moderate, 2 gentle and 1 very gentle).

In order to get objective data under comparative conditions, cylinders of standard size (2 cm. diameter and 2·5 cm. height) were loaded in the machine for 2 sec. and then released, deformations at the end of the loading period and after one minute's recovery being recorded. These experiments were done a short time after the completion of the main experiment. In order to get some measure of the extent to which the materials harden as a result of compression (strain-hardening), the loading experiment was repeated, compressing for 10 sec. and measuring the total deformations produced after 2 and 10 sec. The ratio of the former to the latter gives a rough measure of strain-hardening, and the means of such ratios for duplicate tests are given in Table II.

Table II

Sample	1	2	3	4	5	6	7	8
Strain-hardening factor	0·76	0·77	0·78	0·90	0·72	0·95	0·90	0·81

It was not considered practicable to make a direct measure of the effect of increasing the load in decreasing the viscosity of the materials ('structural viscosity') but earlier experiments had shown that the addition of rubber to plasticine rapidly decreases both strain-hardening and 'structural viscosity'.[1] It therefore seemed probable that subjects who squeeze for a short period (high *t*-score), thus avoiding high strains and minimizing strain hardening, and also use a big force (high *p*-score), thus taking advantage of high 'structural viscosity', should tend to place 'dead' samples, such as 6, soft with respect to more rubbery samples such as 5, which show much less work-hardening, and probably less 'structural viscosity'. In Fig. 1 *a* (p. 68) are plotted the mean positions of sample 6 divided by those of sample 5 for each subject against $\sqrt{(t\text{-score} \times p\text{-score})}$. A correlation coefficient was calculated and is clearly significant (about 0·77, the significance being $P \simeq 0{\cdot}0005$). Although samples 6 and 3 do not differ as markedly as do 6 and 5, they are so similar in subjective firmness (the mean positional numbers for all subjects being 5·43 for 6 and 5·08 for 3) that it is of interest to give the scatter curve for this pair as well (Fig. 1 *b*). In this case the correlation coefficient was 0·73 with a significance of $P = 0{\cdot}001$.

It seems then, that in the case of a 'dead' sample such as 6, prolonged squeezing, instead of favouring a 'soft' judgement due to the continued flowing, favours a 'hard' judgement owing to the effects of strain hardening, and that the use of a big force, by reducing the viscosity, favours a 'soft' judgement.

To return to the first experiment in which cylinders were loaded for 2 sec. (see p. 66), the means of a number of replicates are given in Table III, the deformations being given directly in cm.

The mean positions for each sample, derived from the subjective orders, are also given. It will be seen that some of the samples have changed their positions during the course of the experiment. A further analysis, not here described in detail, showed that there were slight aging effects in some samples. If these tendencies are roughly extrapolated to the date at which the objective measurements were made, it appears that the mean subjective order agrees fairly well with the order of total deformations from Table IV, namely:

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[1] These materials and many like them offer relatively less resistance to larger than to smaller loads, the phenomenon known as 'structural viscosity'. This is quite distinct from the hardening which takes place due to deformation and, in the case of compression, the two effects operate in opposite senses.

$$7 < 8 < 5 \leqq 3 < 6 < 4 < 2 < 1$$

(where < indicates 'softer than').

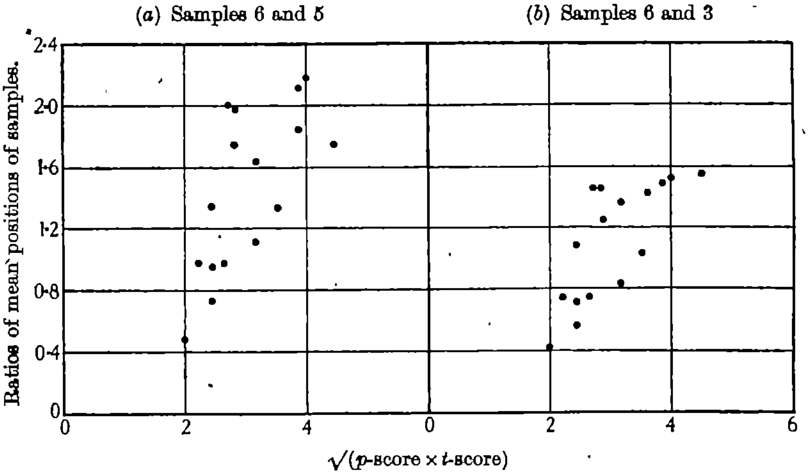

Fig. 1.

Table III

Objective data:	1	2	3	4	5	6	7	8
	Sample no.							
Total deformation after 2 sec. loading	0·262	0·283	0·443	0·324	0·449	0·406	0·929	0·560
Recovered deformation after 1 min. recovery	0·237	0·254	0·317	0·135	0·317	0·039	0·094	0·256
Non-recovered deformation	0·025	0·029	0·124	0·189	0·132	0·367	0·833	0·324
Mean 'subjective' position:								
First half of experiment	1·12	1·96	5·11	4·28	3·61	5·85	8·00	6·05
Second half of experiment	1·13	2·05	5·04	4·13	4·24	5·05	8·00	6·37
Extrapolated subjective position	1·14	2·14	4·96	3·99	4·89	4·29	8·00	6·67

IV. THE TREATMENT OF THE DATA OBTAINED

A summary of all the data is given in Table IV, in which 'Mean position' indicates the average of the positions numbered from 1 (hardest) to 8 (softest) given by each subject on the twenty-five occasions on which the test was performed.

(1) *Statistical treatment*

The experimental data were divided into two parts, the 'first half' consisting of the first thirteen placings, and the 'second half' of the last twelve placings.

The variance of each sample for each subject was found for both halves, working about the means of each half of the experiment. Each of these variances was divided by the number of placings in that half-experiment and the square roots were taken. These figures are denoted by σ_1 and σ_2 respectively. Then σ_1 is taken as the index of self-consistency for the first half, and σ_2 as the index for the second half of the experiment. The learning factor, which is denoted by Λ, is defined as σ_1/σ_2. A complete analysis of variance, which would have been desirable, was ruled out because of the non-orthogonality of the factors. However, when the technologists, observers and certain other individuals were put on one side, we were left with a group of eight subjects in which sex was orthogonal to $\Sigma\rho$.

(2) *Analysis of variance for eight subjects in orthogonal classes*

With one exception, the analyses of the data for σ_1, σ_2 and Λ showed no significant main effects or interactions.[1] The exception was in the analysis for σ_2 where the $\Sigma\rho$ classification was significant at $P=0\cdot05$, the $\Sigma\rho$ subjects giving better self-consistency than the non-$\Sigma\rho$ subjects. It is noteworthy that the routine testers were in no case experienced in work

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[1] Throughout this work, we have preferred to quote, for each conclusion, numerical values of P (the probability that a result at least as extreme as the observed result should have arisen by random sampling from a homogeneous population), rather than to use the conventional terminology whereby values of $P<0\cdot05$ are baldly described as 'significant', all greater values being considered as 'non-significant'. While we realize the danger of any relaxation of the standard of confidence, we feel that in exploratory work of this kind, a level of P somewhat greater than $0\cdot05$ may give a valuable indication of the direction in which further investigations might profitably proceed. Further it must be emphasized that values of $P<0\cdot05$ will not infrequently arise purely by the operation of chance. Any attempt to establish a sharp demarcation on the scale of P is quite unreal and frequently most misleading.

Table IV

Subject's category		Average time taken for test (min.)			Sample no. 1	2	3	4	5	6	7	8	Mean of σ's	Λ
fO	(26)	4·6	1st half	Mean position	1·08	1·92	5·46	3·77	3·31	6·77	8·00	5·61	0·44	1·9
				σ_1	0·266	0·266	0·634	0·422	0·605	0·576	0	0·738		
			2nd half	Mean position	1·00	2·00	5·00	3·42	3·67	7·00	8·00	5·92	0·23	
				σ_2	0	0	0·408	0·494	0·623	0	0	0·277		
mO	(37)	1·7	1st half	Mean position	1·00	2·00	5·00	4·00	3·39	6·76	8·00	5·69	0·46	1·0
				σ_1	0	0	1·039	0·957	0·486	0·570	0	0·604		
			2nd half	Mean position	1·17	1·83	4·50	5·00	3·17	7·00	8·00	5·33	0·45	
				σ_2	0·373	0·373	0·957	0·500	0·373	0	0	0·850		
mO	(25)	3·2	1st half	Mean position	1·15	1·92	6·00	3·46	4·16	4·85	8·00	6·46	0·66	1·7
				σ_1	0·362	0·474	1·109	0·746	0·890	1·166	0	0·499		
			2nd half	Mean position	1·00	2·00	5·92	3·16	6·25	4·00	8·00	5·67	0·39	
				σ_2	0	0	0·492	0·550	1·235	0	0	0·847		
fεΣτ	(38)	1·5	1st half	Mean position	1·31	2·00	6·07	4·08	4·23	4·46	8·00	5·85	0·92	1·4
				σ_1	0·606	0·554	1·095	0·997	1·761	1·079	0	1·292		
			2nd half	Mean position	1·08	2·66	6·17	4·17	5·42	2·42	8·00	6·08	0·65	
				σ_2	0·279	0·745	0·896	0·797	0·952	0·640	0	0·862		
fεΣτ	(39)	1·8	1st half	Mean position	1·07	1·92	4·16	4·22	3·77	6·92	8·00	5·91	0·50	0·69
				σ_1	0·266	0·266	0·883	0·972	0·697	0·266	0	0·614		
			2nd half	Mean position	1·25	1·75	5·25	3·67	4·08	5·83	8·00	6·16	0·72	
				σ_2	0·432	0·432	1·165	0·745	1·045	1·400	0	0·539		
fεΣτ	(22)	1·5	1st half	Mean position	1·15	1·84	3·92	5·00	3·31	6·92	8·00	5·84	0·43	0·61
				σ_1	0·362	0·362	0·612	0·678	0·605	0·267	0	0·534		
			2nd half	Mean position	1·17	1·83	4·17	4·83	3·92	5·58	8·00	6·50	0·70	
				σ_2	0·373	0·373	1·166	0·800	0·917	1·386	0	0·621		
fεΣτ	(36)	2·05	1st half	Mean position	1·00	2·00	4·33	5·00	3·00	6·50	8·00	6·16	0·34	0·65
				σ_1	0	0	0·473	0·707	0	0·957	0	0·554		
			2nd half	Mean position	1·00	2·00	4·17	4·17	3·92	6·25	8·00	6·50	0·52	
				σ_2	0	0	0·800	0·800	0·968	1·105	0	0·500		
fεΣτ	(54)	1·9	1st half	Mean position	1·15	2·31	6·00	4·08	4·69	2·85	8·00	6·93	0·50	0·73
				σ_1	0·362	0·605	0·392	0·917	0·462	0·948	0	0·267		
			2nd half	Mean position	1·50	3·00	5·17	3·84	5·58	2·00	8·00	6·84	0·68	
				σ_2	0·645	1·000	0·986	0·810	0·862	0·913	0	0·350		
mΣρ	(36)	3·2	1st half	Mean position	1·08	1·92	6·15	3·38	4·37	4·84	8·00	6·23	0·62	1·2
				σ_1	0·256	0·256	0·865	0·487	1·149	1·100	0	0·845		
			2nd half	Mean position	1·08	2·00	6·16	3·33	4·93	3·92	8·00	6·57	0·53	
				σ_2	0·276	0·408	0·690	0·467	0·760	0·953	0	0·640		
mΣρ	(40)	1·0	1st half	Mean position	1·08	2·31	4·69	4·76	3·61	5·15	8·00	6·37	0·88	1·83
				σ_1	0·266	0·911	1·315	0·891	1·212	1·510	0	0·925		
			2nd half	Mean position	1·00	2·25	5·41	5·13	3·92	3·25	8·00	7·00	0·48	
				σ_2	0	0·424	0·755	0·762	0·954	0·924	0	0		

Table IV (*continued*)

Subject's category	Average time taken for test (min.)			Sample no. 1	2	3	4	5	6	7	8	Mean of σ's	Λ
$f\Sigma\rho$ (18)	5·1	1st half	Mean position	1·07	1·92	4·84	4·53	3·00	7·00	8·00	5·61	0·32	1·3
			σ_1	0·266	0·266	0·769	0·635	0	0	0	0·626		
		2nd half	Mean position	1·00	2·00	4·92	3·50	3·67	7·00	8·00	5·91	0·25	
			σ_2	0	0	0·492	0·763	0·473	0	0	0·277		
$f\Sigma\rho$ (21)	5·3	1st half	Mean position	1·00	2·00	4·69	4·77	3·00	6·61	8·00	5·93	0·38	1·7
			σ_1	0	0	0·910	0·799	0	0·737	0	0·615		
		2nd half	Mean position	1·00	2·00	4·25	4·50	3·25	7·00	8·00	6·00	0·23	
			σ_2	0	0	0·595	0·646	0·595	0	0	0		
$m\epsilon\Sigma$ (36)	1·7	1st half	Mean position	1·23	1·77	5·15	3·93	3·77	6·15	8·00	6·00	0·71	1·3
			σ_1	0·421	0·421	1·025	0·730	0·887	1·405	0	0·774		
		2nd half	Mean position	1·08	1·92	5·58	3·33	4·50	4·83	8·00	6·75	0·57	
			σ_2	0·276	0·276	1·115	0·471	0·952	0·896	0	0·596		
f (20)	2·8	1st half	Mean position	1·15	1·84	4·84	5·22	3·07	6·30	8·00	5·53	0·63	1·6
			σ_1	0·371	0·371	1·165	0·576	0·263	1·135	0	1·083		
		2nd half	Mean position	1·08	1·92	3·83	5·00	3·25	6·33	8·00	6·57	0·38	
			σ_2	0·279	0·279	0·533	0·407	0·433	0·622	0	0·493		
f (35)	2·3	1st half	Mean position	1·38	2·00	5·31	4·15	3·77	4·76	8·00	6·61	0·96	0·94
			σ_1	0·837	0·554	1·265	1·230	0·890	1·671	0	1·239		
		2nd half	Mean position	1·54	2·46	5·30	4·22	4·46	3·23	7·92	6·84	1·02	
			σ_2	1·038	0·968	0·668	1·131	1·390	2·010	0·277	0·690		
m (33)	2·3	1st half	Mean position	1·08	1·92	5·00	4·31	3·15	6·22	8·00	6·30	0·54	0·83
			σ_1	0·353	0·353	0·784	0·605	0·360	1·118	0	0·720		
		2nd half	Mean position	1·16	1·84	4·58	4·25	3·75	5·75	8·00	6·67	0·65	
			σ_2	0·373	0·373	0·953	1·091	0 923	1·091	0	0·471		
m (46)	2·5	1st half	Mean position	1·15	1·92	4·46	4·84	3·77	5·92	8·00	5·92	0·81	1·2
			σ_1	0·368	0·475	1·284	0·934	0·800	1·638	0	0·994		
		2nd half	Mean position	1·08	2·00	5·17	4·33	4·08	4·50	8·00	6·83	0·70	
			σ_2	0·276	0·408	1·020	1·028	1·074	1·443	0	0·373		
$f\epsilon$ (36)	2·7	1st half	Mean position	1·23	1·77	5·00	4·00	3·31	6·69	8·00	5·82	0·56	1·1
			σ_1	0·421	0·421	0·775	0·957	0·450	0·604	0	0·860		
		2nd half	Mean position	1·33	1·67	4·17	4·25	3·50	6·75	8·00	6·17	0·50	
			σ_2	0·471	0·471	0·800	0·722	0·762	0·433	0	0·373		
$f\epsilon$ (41)	2·7	1st half	Mean position	1·00	2·00	5·77	3·69	3·92	5·46	8·00	6·16	0·45	1·5
			σ_1	0	0	0·422	0·462	0·915	1·691	0	0·949		
		2nd half	Mean position	1·00	2·00	6·00	3·67	5·17	3·38	8·00	6·83	0·30	
			σ_2	0	0	0·488	0·526	0·371	0·526	0	0·552		

of the type which was the subject of this experiment and yet that they were able to transfer in some measure an ability acquired in another field.

(3) *Analysis for classifications τ and O*

On making a *t*-test in which the data from the above eight subjects were compared with those from the five $f\epsilon\Sigma\tau$ subjects (i.e. all τ subjects), it was found that the $f\epsilon\Sigma\tau$ subjects were inferior in learning. The levels of significance for Λ, σ_1 and σ_2 were:

$$\begin{aligned}\text{For}\quad \Lambda\quad & P=0{\cdot}02,\\ \sigma_1\quad & P=0{\cdot}4,\\ \sigma_2\quad & P=0{\cdot}4.\end{aligned}$$

These data present an apparent anomaly in that the σ_1 and σ_2 values show no significant effect whereas the Λ values, which are merely their ratio, show a markedly significant one. This anomaly arises from the fact that there is a very large dispersion in the initial values for all subjects, while the trend in the course of the experiment is predominantly towards poorer self-consistency for τ subjects and towards better self-consistency for non-τ subjects.

A '*t*' test was carried out between the *f*'s and the *m*'s, the *O*'s being excluded from both categories. It was found that for σ_1, the women were more self-consistent, the probability being 0·1, while for σ_2 there was no appreciable difference.

Similar tests for *O*'s and non-*O*'s showed that while for the first half of the experiment the *O*'s were superior, with a probability however of only about 0·4, in the second half, the *O*'s were superior, with a probability of between 0·1 and 0·2. For Λ, the superiority of the *O*'s had a probability of 0·1.

Similarly for the routine testers against the rest, for σ_1, there was no appreciable difference.

However, the superiority of the $\Sigma\rho$'s for σ_2 had a probability of between 0·05 and 0·1, while for Λ their superiority had a probability of between 0·1 and 0·2.

It would appear from the data in Table IV as if the younger subjects were superior in self-consistency and learning but, owing to non-orthogonality, no adequate statistical test of this is possible.

Standard deviations were then calculated as before, the experiment being divided into 'warm' and 'cool' halves. Of nine subjects who expressed a preference for testing on a warm day when the samples were softer, seven showed a better self-consistency at high temperatures as against low; while, of four subjects who expressed a preference for a cool day, three had a slightly better self-consistency during the cool half of the experiment. The data on this point gave the value $P=0{\cdot}12$.

There was no correlation between the opinion expressed by the subjects as to the value of the experiment, and either σ_1, σ_2 or Λ, nor between these indices and methods of handling or age. The opinions expressed by subjects as to the probable value of these experiments are believed to be in no way correlated with the amount of trouble which the subjects took. As will be shown later, this latter factor probably has an important influence on self-consistency.

At certain stages in the experiment a subject would sometimes change drastically the position of a particular sample. A test was done to see whether there was any tendency for such changes to be slowed down as a result of a kind of mental inertia. An analysis of a completely random ordering of samples showed that, with the possible exception of sample 6, no such phenomenon occurred.

(4) *Mutual agreement of the subjective ranking orders*

In order to test whether the τ group showed superior mutual agreement as a group over other categories of subject, the standard deviations were taken for the mean positions of each sample for the whole of the τ group and compared with those for all other subjects (excluding O subjects) taken as a group. The results taken as a mean for all samples are given in Table V.

Table V

	First half	Second half
Mean deviation for non-τ group	1·28	3·21
Mean deviation for τ group	3·92	4·62
Significance level, P	0·02	0·15

This shows that, especially in the first half of the experiment, the technologists showed very definitely less agreement among themselves than did other subjects.

Moreover, in both classes the agreement becomes less close as the experiment proceeds, which is contrary to expectation, and the τ subjects at the start are already showing a more marked individuality than do the remainder at the end of the experiment. It appears, therefore, that the closest agreement in subjective ranking order is found in a group of subjects having no previous experience of this type of task. With progressive experience, the individuals of a group appear to develop more individuality of judgement of firmness of materials when variations in springiness must be taken into account.

The results of the statistical analysis other than those given in Table V may be summarized as shown in Table VI.

Table VI

	Groups being compared			Mean for group	Mean for group		
	(*a*)	(*b*)	Criteria	(*a*)	(*b*)	*P*	Remarks
8 orthogonals	$\Sigma\rho$	Non-$\Sigma\rho$	Λ	—	—	$\gg 0\cdot05$	
			σ_1	—	—	$\gg 0\cdot05$	
			σ_2	—	—	0·05	
	Interaction of sex on $\Sigma\rho$		σ_1	—	—	$>0\cdot05$	$f\Sigma\rho$'s more self-consistent
	τ	8 orthogonals	Λ	0·82	1·31	0·02	
			σ_1	0·54	0·64	0 4	
			σ_2	0·65	0·54	0·4	
	τ	Rest excluding *O*'s	σ_1	0·54	0·62	0·5	
			σ_2	0 65	0·51	0·25	
	τ	*f* and $f\Sigma\rho$	Λ	0·82	1·36	Nearly 0·05	
	f	*m*	σ_1	0·54	0·71	0·1	*O*'s excluded
			σ_2	0·55	0·58	0·8	
	Σ	Rest excluding *O*'s	σ_1	0·52	0·60	0·45	
			σ_2	0·36	0·56	0·15	
			Λ	1·56	1·15	0·1	
	ρ	All others	σ_1	0·55	0·59	0·7	*O*'s excluded
			σ_2	0·37	0·57	0·07	
			Λ	1·49	1·14	0·15	

V. DISCUSSION

The importance of the problem of expert superiority has long been realized. McDougall (2), p. 245) writes: "As all the world knows, since Plato and Herbart, each subject perceives only what he is capable of perceiving, only what he is prepared by nature and by experience to perceive. We may fairly assume that, in any two normally constituted persons, the sensory effects of similar sense stimulations, the sensory qualities experienced, are alike; yet, as we know, they may perceive, in response to similar sensory stimulations, very different objects, or perceive the object with very different degrees of adequacy. In every field the expert perceives far more than the inexpert; because he reacts upon similar sense impressions with a more adequately prepared mind. In some senses, the stored traces of his many experiences in his special field of observation rise up to meet the sense-impressions and to mould them in conformity with those past experiences."

To-day we are perhaps less confident that the sensory qualities of normally constituted persons are so much alike, since we have, in fact, no way of knowing. It has been proved that certain types of experience, e.g. routine work of a kind quite unlike the task presented, make it possible for subjects to acquire a superior capacity for distinguishing materials showing simple physical characteristics, such as viscosity and elasticity, when these properties differ by small amounts in the materials judged (1). The effective experience may have no direct connexion with judging materials by handling, but may involve rather the development of a particular type of mental attitude, such as that induced by long practice in routine analytical operations. Routine workers such as analysts are less likely than most other subjects either to allow themselves to be affected by boredom, or by doubts as to the value of the tests they are asked to do.

In such cases at least, there is no reason to suppose that the sensory qualities experienced in handling materials are in any way modified. Trained technologists who might be expected to possess in a special degree traces of previous experience which would be advantageous in such experiments, are, in the long run, in no way superior in self-consistency to the ordinary subject, but rather the reverse. In the earlier stages of the experiment, the technologist appears to be superior, although the significance level is only $P=0{\cdot}4$, but in general such subjects do not improve, so that, taking the experiment as a whole, the group is slightly inferior. (Significance level $P=0{\cdot}3$.) This is surprising, since one would expect from purely physical considerations that a capacity to reproduce joint movements both with respect to their extensive and intensive factors (i.e. both for strain and stress) with superior accuracy, must yield more consistent sensory stimulations likely to lead to a superior consistency of judgement. That experts in other fields can reproduce their movements more perfectly than inexperts seems fairly certain; this is, for example, convincingly shown by the ability of figure skaters to reproduce curves cut on the ice, which forms a fair criterion of the skill of the skater. That the superiority of such experts is not limited precisely to those movements which they have already learned, but can be carried over to new but similar movements, is shown by the fact that experts learn new figures more quickly, and even at the first attempt give a better performance than do inexperts.

Head has proposed (3) a theory which postulates the existence of 'schemata' which "modify the impression produced by incoming sensory impulses in such a way that the final sensations of position or of locality rise into consciousness charged with a relation to something that has gone before"; and Bartlett (4) has extended this theory very considerably.

At first sight it would appear that Head's theory should lead us to expect an almost automatic series of responses for a given series of stimuli, but Bartlett points out that "man must learn how to resolve the 'scheme' into elements, and how to transcend the original order of occurrence of these elements. This he does, for he learns how to utilize the constituents of his own 'schemes' instead of being determined to action by the 'schemes' themselves, functioning as unbroken units".

As mentioned in the earlier paper (1), Prof. Bartlett suggested to us that the theory of schemata might well be applicable to our problem. One would certainly expect the technologists to acquire "some kind of functional standard which they can use, not in any such specific form that is recognized or remembered, but in very much the same manner as Head supposed his postural schemata to work".[1]

The experiments described in the present paper were done on materials physically (i.e. rheologically) similar to cheese, but our cheese-maker subjects, with one exception, emphasized to us the dissimilarities rather than the similarities and, after the test, expressed the general opinion that their technological experience could not be expected to have helped them in the experiment. These subjects did not improve in self-consistency during the course of the experiments, as did most of the other subjects, and, except possibly in the first half of the experiment taken alone, were not superior, as a group, in self-consistency. The exception was a cheese-maker subject who, expecting that her technological experience would be advantageous, although being very modest as to her own powers of testing, improved appreciably during the course of the experiment. Two of the best-known cheese-graders in the South of England performed the test once and three times respectively. The agreement between these two subjects was poor, the self-consistency of the latter was apparently below average, and the former placed sample 7 as firmer than sample 8, a judgement only once given in the course of our 475 regular tests, and that by one of the least self-consistent subjects.

We must conclude that any advantage that these technologists may have had as a result of their experiences in testing materials very similar but not identical with those used in this experiment, did not produce any superior self-consistency which could be maintained during a longish series of tests. Although there is no quantitative evidence, it is our opinion that this is due primarily to mental attitude. Such subjects are used to certain conditions when they test materials. First, their opinion is generally accepted almost without question; secondly, every single judgement given is for immediate practical use; and thirdly, there is no doubt that properties judged by handling by these technologists are seldom assessed without confusion with appearance and smell, in which our materials could not aid their judgements. In the earlier stages of the experiment, the novelty of the tests combined with a comparatively open mind as to their usefulness, probably helped to give good results, whereas later, the apparent purposelessness of a daily test on the same materials caused a deterioration of self-consistency. This was perhaps increased by a natural distaste, not fully shared by other subjects, for activities which must have seemed to the technologists to have been copied, and badly copied at that, from their usual purposeful activities.

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[1] Prof. Bartlett, private communication.

This inflexibility of technologists, although disadvantageous to rapid adaptation, is doubtless important in giving self-confidence, and also in helping them quickly to identify and discard any material unlike that usually met with, which is perhaps useful in establishing the technologists' standard on which industry still places so much reliance.

VI. SUMMARY

1. Experiments are described on the self-consistency and its improvement with practice, of various types of person in reproducing judgements of the comparative 'firmness' of materials which differ in both elastic and plastic properties.

2. In the case of such materials, technologists who are used to comparing the 'firmness' of similar substances show little superiority over other subjects in earlier tests, and are somewhat inferior after the test has been repeated a number of times. The reasons for this, which are believed to depend largely on mental attitude, are discussed. The technologists agree among themselves definitely less closely than do the other subjects. Moreover, with the progress of the experiment, both technologists and others tend to disagree more and more.

3. Routine analysts, hitherto quite inexperienced in this type of testing, showed a marked superiority over other subjects, including the technologists. This again points to mental attitude as preponderant in tests of this kind.

4. Scientific training and sex show comparatively little effect on self-consistency or learning capacity. Knowledge of the progress of the experiment was slightly advantageous.

5. There is a marked correlation between the force and speed of handling and the relative positions given to 'elastic' and 'dead' materials

in placing them in order of 'firmness'. The importance of the reproducibility of stresses and times in making such judgements by handling materials is discussed, and it is shown that an eight-fold difference in time of handling gave a reversal of 'firmness' judgement in comparing an elastic body of constant compression modulus with viscous bodies whose viscosities varied over a considerable range. This effect is also present when a body of constant viscosity is compared with a series of elastic bodies of varying compression modulus.

6. The mean subjective order for eight samples in the 475 tests performed by nineteen subjects agreed closely with the objective measurements of total compression, elastic and plastic, produced under standardized loading conditions.

The authors wish to thank Dr P. White who is responsible for the statistical treatment of the data, and Mr F. Johnson Dix who has carried out many of the computations, as well as the twenty subjects whose patient co-operation has made this research possible.

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APPENDIX

Note on physical terms used in this paper

It has been impossible to avoid using certain technical physical terms in the presentation of this paper, although such use has been reduced to a minimum. For the benefit of those unfamiliar with these expressions, the following short notes are appended:

Stress represents the force exerted on each square-centimetre of the material. (Dimensions $\frac{\text{force}}{\text{area}} = \text{mass} \times \text{length}^{-1} \times \text{time}^{-2}$.)

Strain (in compression) is the amount of deformation produced, expressed (at least for small strains) as a proportion of the original height of the sample, and is thus dimensionless.

A true fluid is a material whose rate of flow is proportional to the stress causing the flow, i.e. a material which shows some flow, however small the stress applied. The constant of proportionality is called *viscosity*. In cases where viscosity is not independent of stress (not true fluids) it is frequently quoted for a standard condition of stress. (Viscosity has dimensions mass × length^{-1} × time^{-1}.)

An elastic solid shows an immediate deformation ('strain') proportional to the load applied to it, and this deformation is recovered when the load is removed. In many materials (not truly elastic solids) the recovery is neither complete nor immediate. The ratio of the stress applied to compress the solid to the strain produced is called the *compression modulus*. The modulus, being a stress divided by strain, has the same dimensions as stress, i.e. mass × $\text{length}^{-1} \times \text{time}^{-2}$.

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THE PSYCHOLOGY OF THE HISTORY AND ORGANIZATION OF ASSOCIATION FOOTBALL[1]

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PART I[2]

I. *Introduction* (pp. 80–81).
II. *Medieval and early football* (pp. 82–84).
III. *The Football Association* (pp. 84–87).
IV. *The International Board* (pp. 88–90).
V. *The F.I.F.A.* (pp. 90–93).

I. Introduction

Football and cricket are strikingly social games. Tennis can be aggressive and individualistic; golf can be particularly aggressive, and, if there is no better rival, it can always be a lonely game in which one plays against Bogie. The individual gifted football player has never been able to draw crowds by his own personal prowess alone, without ten players to support him and eleven to play against, and some footballers have found this out to their cost. The public does not go to see particular teams doing acrobatics with a ball. They go to see the match, though some may support one side and some the other. Unless a given player could play with a team approximately his equals, and that team against another team matched well with it, there would be little or no interest in organized football as we know the game. The individual player who has private fantasies of self-importance cannot afford to detach himself from his club, or that club from its League and Association connexions,

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[1] I should like to express my warm appreciation of the kindness which has always been extended to me by members of The Football Association Council and of the International Football Association Board, but they are in no way responsible for any ideas expressed in this paper. I am specially indebted to my father, the late W. Pickford, who was President of The Football Association, for his help with the historical part. I am also indebted to my wife for her constructive criticisms, and to Profs. F. C. Bartlett and M. Ginsberg and to Dr J. T. MacCurdy for their encouragement. This paper was written for a group of Social Psychologists who met at Bellingham in June 1939, and it was read to them and also to the Scottish Branch of the British Psychological Society in December 1938.

[2] The references included in Part I of this paper will be listed at the end of Part II.

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because the whole interest of the game lies in the organization of matches and competitions, and without that organization its tremendous public interest would rapidly dwindle and vanish.

We might almost say that the object of play is to have a good game and not even primarily to win the match. Competition is an essential part of such a match, but a good game is not to be got merely by battering an opponent, and therefore a new kind of interest develops under these conditions. It is the interest of constructive social activity in which fair play controls the proceedings.[1] This means that the game is conducted in such a way that everybody gets something and nobody gets everything, and, from the point of view of social psychology, essentially the something which everybody gets is the comradeship of everybody else (cf. Suttie (22)). The great interest of games like cricket and football is due to their capacity to foster comradeship by combining team work with a form of competition which has lost its destructive and hurtful qualities (cf. Rimet (19)). The rules and laws of these games were not invented by some expert who sat in a chair and evolved the rational football or cricket according to logical principles; on the contrary, they were formulated in response to the actual problems of play, and are the concrete expression of the deep-seated desire for harmonious games.

Certain data about the history and expansion of association football have been chosen in order to illustrate how traditions of co-operative enterprise have been built up in the development of regularized football, with the limitation of individual mastery and acquisitiveness. It seems to be the most essential point in the development of regularized football, that co-operative enterprise in a social activity in which so much aggression and so many ideas about individual and group conflict are involved, would not have been possible apart from the fundamental importance of fair play in group games. Since possibilities of conflict and aggression are also involved in almost all human co-operative activities, the history of football is of some psychological value in relation to problems of group organization in general. The historical data are interesting in connexion with the problem of avoiding threats of international aggression, and they also show how association football has spread widely with an amount of change unusually small in the transmission of a branch of ceremonial culture.

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[1] The writer hopes to discuss the psychology of fair play and some other aspects of games and sports in a later paper. Compare the 'fair play' in games with the 'art work' in pictures (24), and with *morale* in other situations (18). Football often seems like a form of territorial combat, which is common in the animal kingdom (1).

II. MEDIEVAL AND EARLY FOOTBALL

Games of football have been a form of ceremonial culture since ancient times, and they have been widespread in one form or another in many parts of the world. There is evidence that football was played in China in the third century B.C., with a round ball stuffed with hair. An air-filled ball was introduced in the fifth century A.D. (9). An interesting game called *Kemari* has been played in Japan for about fourteen centuries (23). The ground was about fourteen metres square. There was a pine tree at the north-west corner, a willow at the south-east, a cherry tree at the north-east and a maple at the south-west. There were usually eight players, and the match was a ceremonial kicking of the ball from one to another—it was not a competitive game according to our ideas of football. It seems unlikely that the British medieval games of football were descended from the Roman game of *harpastum*, though it may have influenced them; the Greek game of *episkyros* seems to be more closely allied to modern football (9). There is evidence that games of football have been widespread among many different tribes and peoples (7, 15).

The medieval Florentine game of *calcio* still survives (13, 25). It is played in the *Piazza della Signoria* in Florence, twice a year, on the first Sunday in May and on 24 June, the Feast of St John Baptist, the patron saint of Florence. There was a memorable game in 1530, when the Florentine nobility played *calcio* under fire of the Imperial troops besieging the city. It is the occasion of a pageant with revival of sixteenth-century dress and armour, and a feature of the celebrations is the procession before the game. The day of the game is a public holiday and shops are closed. The two sides are called *bianchi* (whites) and *rossi* (reds), and each team consists of twenty-one players of whom eleven are forwards and the remainder defend the goal, which extends the whole width of the 'field'. The *Piazza* is covered with a layer of sand for the occasion.

The games of football played in medieval Britain seem to have been very violent and usually to have involved many if not most of the able-bodied inhabitants of a village or district, and many attempts were made to put them down by law.[1] In 1314 there was a proclamation by Edward II which prohibited the hustlings over large balls (*ragaries de grosses pelotes*), and in 1349 a game designated in the statute by its present name was objected to by Edward III. Similar attempts were made to suppress football by Richard II, Henry IV, Henry VIII and Elizabeth. It is of great interest that the most serious objection to football in these times was that it drew young men away from the 'manly' occupations of learning archery and the arts of warfare. The importance of this will be seen later. In the seventeenth century football declined in popularity, but was kept alive by the younger generation and ultimately became a regular part of public school life, and developed again in the athletic revival of the nineteenth century.

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[1] Gibson and Pickford (10), Jackson (11) and Shearman and Vincent (21) have been the chief sources of data about the game up to about 1900, except where otherwise stated. The *F.A. Handbook* (20) and the *F.I.F.A. Handbook* (8) have been useful throughout.

It is important to stress the violent and uncontrolled nature of the medieval games. When football was to be played, as it was often in the streets, shopkeepers put up their shutters, and sometimes during the game many people received serious injuries. By the beginning of the nineteenth century it seems to have become more restrained; fewer players took part and definite goals, two or three feet wide, were used. Shrove Tuesday was often the ceremonial occasion for games of football, and there have been survivals of this through the nineteenth century. At Corfe Castle the game was the annual celebration of the charter granted to the 'marblers' of Purbeck by Queen Anne, whereby the 'free' men of the stone trade were allowed on certain conditions to open quarries and dispatch stone by sea. The game recorded in the year 1902 was an initiation ceremony by which fourteen lads were made 'free'. At Scone the Shrovetide game of football was a combat between the bachelors and the married men; in Midlothian and at Inverness it was between the married and single women. The ball was probably identified symbolically with the pancake of Shrove Tuesday. An interesting game is recorded (10) for which a 'pancake football' was made out of bottle-corks enclosed in a large bag. The ball was broken in the fight and each cork gained was the token for a gill of ale. The game was played in northern villages. The game called 'hurling' was often between rival villages, parishes or towns.

These games, differing from place to place in motive, purpose and manner of play, and in other details, were adopted by the English public schools or transmitted to them, and most of these schools had developed their own peculiar forms of football by the beginning of last century. In these schools the games became traditional and stabilized, and, though still violent, tended to become simpler and more definitely organized with accepted laws of play. Different traditions developed, however, and it is interesting to note that Eton was unfavourable towards handling the ball, while at Rugby handling was accepted, and, though at Rugby 'hacking' above the knee was in general 'unfair', a player who had the ball when he was in a maul and refused to put it down might be hacked legitimately. The games differed much from school to school, and it would have been difficult for matches between different schools to have taken place, but on the whole football became refined and whittled down towards its present form. It became less violent and smaller numbers of players took part; sides were of equal numbers; it was played on fields or grounds of recognized and limited extent and with standardized goals. Certain essential laws of play became established and have led to the present principles of throwing-in, off-side, handling (as in rugby) or not handling, and to the very reasonable objections to kicking, holding down, throttling or otherwise hurting an opponent. Ordering a player off the ground for misconduct seems to have begun at Harrow. The distinction between 'ups' and 'behinds' at Winchester seems to have forecast the present arrangement of forwards, half-backs and backs. 'Umpires' were posted at the goals in the Eton game. At Cheltenham the referee seems first to have appeared. He was chosen by the umpires, but these umpires themselves eventually became the linesmen of the modern game.

III. THE FOOTBALL ASSOCIATION

The essential motivation for the next step in the development of a football game played according to widely accepted laws or rules of play was due to the collection of boys from various public schools as undergraduates at Cambridge University. They wished to form teams and to play football, but did not all follow the same laws of play because they did not all come from the same school. There is a lack of detailed records, but the difficulty due to the variety of public school games must have been an obstacle to undergraduate play, and the desire for this play was sufficient to motivate efforts to come to some kind of understanding. The result of these efforts was the formulation of the 'Cambridge Rules'. An attempt to form a football club at Cambridge University, made by H. de Winton and J. C. Thring, in 1846, was not very successful, and about 1848 a serious attempt was made to formulate a set of laws under which men from different schools could play together. At a meeting held in H. C. Malden's rooms in Trinity College, Cambridge, Harrow, Rugby, Winchester and Shrewsbury were represented, and, between 4.0 p.m. and midnight, the 'Cambridge Rules' were compiled by voting on all the various school rules brought to the meeting by the different school representatives. They consisted of the most harmonious combination of the different school rules which could be made. Copies were printed and distributed, and posted up on Parker's Piece, where many of the matches were played at the time, and these rules appear to have satisfied everybody and worked well. J. C. Thring took essentially the same set of rules to Uppingham School, where he subsequently became a master, and he called them 'The Simplest Game', in 1862, and the text of these rules is still in existence. It is not important to quote the ten rules of the 'Simplest Game' here, but it is interesting that handling the ball was restricted very much, and kicks were to be aimed 'only at the ball', while tripping or heel kicking an opponent was prohibited.

Between 1846 and 1863 several attempts had probably been made to formulate rules which could be applied widely, because clubs were springing up in many places. The Sheffield Club was formed in 1855 and old Harrovians took to playing in Epping Forest about 1859, which was the origin of the Forest Football Club which later became the Wanderers. In October 1863 another committee of Cambridge men, representing Shrewsbury, Eton, Rugby, Marlborough, Harrow, and Westminster, undertook to formulate a new and better set of rules, 'The Cambridge University Football Rules'. These were more elaborate but essentially the same as those of the 'Simplest Game', and again handling was restricted and pushing, shinning, and tripping were forbidden, but charging was allowed. The size of the ground and goals and other conditions of play were fixed definitely.

At this time the centre of activity changed to London, probably because graduates who had gone down from the universities and non-university men became interested in the new and regularized kind of football. In October 1863 a meeting was held at the Freemason's Tavern, London, and the chief clubs were represented. It was decided to form 'The Football Association'. There was some difficulty in getting the public schools to agree to join this Association because they were unwilling to give up their own particular games, and at the next meeting, in November 1863, there were heated discussions about 'hacking', 'tripping' and 'holding'. On 1 December the Blackheath Club, which had been formed in 1858 to promote the 'carrying' game, definitely withdrew. Its members were unwilling to give up hacking. Other clubs of the same opinion also withdrew. It is interesting that this was the beginning of the history of the rugby as distinct from the association game, though later the Rugby Union gave up hacking. Handling, together with the shape of the ball and number of players, are the most important distinctions of rugby as contrasted with association football.

At first the Sheffield clubs did not play strictly according to the

London Association Laws, but in 1867 and the next few years their rules were brought into line with those of the London game. The long series of matches between London and Sheffield began in 1871, and in the same season The Football Association Challenge Cup was started. In the season 1870–1 two matches had been played between England and Scotland, but these do not rank as international matches because the Scottish teams were chosen from among Scots resident in England.

It is not possible to follow in detail the very interesting history of the expansion of The Football Association. At first it was largely concerned with amateur football, with the popularization of the game and the establishment of good standards of sportsmanship for football. Later on it became essential in the interests of the game to deal with the problems of professionalism, and now The Football Association has taken over the control and legislation for professional football in addition to the support and encouragement of amateur players. The Association owes its power and authority to the desire of innumerable clubs and its many component associations, both amateur and professional, to co-operate in arranging competitions, in playing matches and in all the aspects of the immense organization of association football to-day. This is an entirely democratic arrangement. The essential compulsion which makes clubs and associations join The Football Association, play according to its laws and abide by its rules and jurisdiction, is their need for adequate opportunities for play against other good teams. There is no reason why a club or association should not be formed independently, and some independent clubs do exist. For instance, there is an organization which supports Sunday football and arranges competitions on a league basis, though The Football Association prohibits Sunday football for its own members. The scope of the Sunday organization is limited, but its clubs adopt the accepted laws of the association game. There is no reason why an independent club should not make its own laws, but the difficulty of arranging a satisfactory season's programme would be so great for such a club that it would soon find itself under serious handicaps unless it joined the Association.

The Football Association has striven successfully to prevent, as far as possible, private gain as an incentive to the organization of clubs and matches. A restriction has been imposed which limits the amount of interest payable on money lent to clubs in England to 7½% in any one season. Promoters of scratch teams, which might be used for money-making purposes, must obtain permission from the Association to take part in matches unless no gate-money is taken. The authority of the

Association lies in its value to the players, clubs and component associations in organizing the game for their advantage.

It is of special interest that a major split in The Football Association was avoided owing to the capacity of the Association for compromise over professionalism, to which it was originally antagonistic. Secret and even open professionalism and the importation of players, largely from Scotland, who were paid indirectly in one way or another, had grown so much in the north of England, that special efforts to prevent these practices were made between 1882 and 1884. The interest in professionalism, however, became so strong that, in October 1884, some leading Lancashire clubs held a meeting at which it was decided to form a 'British Football Association' which would admit professionalism. The result of this was the appointment of a special committee of The Football Association, which met in Manchester in November 1884 and recommended the legalization of professionalism under strict conditions. After further conflict and opposition, professionalism was duly legalized by the Association in July 1885.

A similar example of the elasticity and spirit of compromise which have always been leading principles in the organization of the game was shown in the relations between the Association and the Amateur Football Alliance. A number of amateur clubs, dissatisfied with being linked through the Association with professional football, seceded in 1907 from The Football Association. After forming the Amateur Football Association and running this organization for several years they failed to attract the mass of amateurs, who were contented to remain in The Football Association. In 1913 the Football Association agreed to recognize the Amateur Association as one of its affiliated bodies, with representation on the Council and a limitation of the number of its clubs to 400. Later its name was changed to the Amateur Football Alliance to distinguish it from The Football Association.

In 1903 The Football Association became a Limited Liability Company with a nominal capital of £100, divided into 2000 shares of 1*s*. each. No shareholder is allowed to draw any dividend upon his holding, and the Company exists for the purpose of supporting and advancing the interests of the game, and not for obtaining or holding control or mastery for its own sake or for money-making. The main part of the takings at association football matches goes towards the expansion and development of the game and not into private pockets.

IV. THE INTERNATIONAL BOARD[1]

In Scotland the ancient game of football seems to have died out about 1820, but the association game was started in Glasgow by the Y.M.C.A., whose members often met to play friendly matches at Queen's Park. In 1867 they formed the Queen's Park Club, and adopted the association rules with some modifications. After this association football spread rapidly in Scotland, and in 1870 the Queen's Park Club joined The Football Association. They were not contented without national independence, and the Scottish Football Association was established in 1873, by a meeting convened by the Queen's Park Club. Eight clubs were in the original Scottish Association, and a cup was bought for £50 to be the trophy in the annual competition which was then started. The Scottish Association was remarkably successful, and adopted from the first a highly independent attitude. The Scots had no intention of allowing the English complete and undisputed authority. The Scottish Association claimed the right to construe the laws as it thought fit, and there were considerable difficulties over interpretations of rules and methods of play in the international matches. These difficulties were not satisfactorily overcome until the establishment of the International Football Association Board in 1885.

As a result of the introduction of the game to Ireland in 1877 by the influence of the Scottish Football Association, the Irish Association was formed in 1880, and soon established its own cup competition and arranged international matches with England, Wales and Scotland. The game was taken up chiefly in Belfast at the beginning and somewhat later spread to Dublin and the south. The Welsh Association was formed at a meeting in Shrewsbury in May 1876, as a result of an international match with Scotland, and so the Scots were largely responsible for the spread of association football both to Wales and to Ireland. In 1877 the Welsh Association Challenge Cup was instituted; in 1879 international matches were begun with England, and in 1882 with Ireland.

There were various points of difference between the Scottish, Irish and Welsh Associations and the Football Association, and, in 1885, at the proposal of the English, an International Football Association Board was established. All differences of opinion were to be referred to the Board, and its decision became necessary for alterations to the Laws of the Game. It was to consist of two representatives from each of the four nations concerned, and this is interesting, because, although these four nations are very unequal in size and wealth, and one of them, namely, England, had a strong claim to be considered the originator of the game, all four have equal voting powers on the Board. This is an important aspect of the conciliatory way in which international football is conducted, and it is perhaps characteristic of England that the proposal to form the Board came from her Association. The separate national associations play by the same Laws of the Game, are independent as far as the affairs of their own countries are concerned, but meet on equal terms to decide questions of importance about international matters. The formation of the International Board was comparable, in some ways, with the original construction of the Cambridge Rules, whereby the various public school representatives met on equal terms to form a game which they could all play at the University.

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[1] Data about the International Board were obtained from Gibson and Pickford (10) and from Pickford (16).

In addition to the two representatives each from England, Scotland, Ireland and Wales, two representatives of the International Federation are also members of the Board. These men from the Continent will be mentioned again later. The secretaries and treasurers of the different national associations also attend the Board meetings, and occasionally other members of the associations, but without voting power. The Board meets once a year, in each of the four British countries and on the Continent, in rotation. After a meeting the minute book is sent to the secretary of the Association in whose country the next meeting will be held. The arrangements for this meeting are in his hands, and his Association will entertain the Board. The pairs of representatives are chosen by their own associations and they are usually senior members. At a given meeting a representative of the country in which it is held, usually the senior representative, presides over the Board meeting, and so both the chairman and the secretary of the Board change year by year. The meetings are very friendly, and from the beginning much has been made of their social side. These social aspects were possible partly because of the small number present, the interest created by the variety of nationalities and the spirit of friendly rivalry between them, but largely because of the comradeliness of the members themselves. Nevertheless, members are downright and outspoken—forthright, as the Scots like to say—when matters of national importance are discussed, so that the meetings are friendly though not always tranquil. In this manner the Board has conducted the international business of English, Scottish, Irish and Welsh Association Football in a harmonious and constructive way for over fifty years, and warmth of national feeling has not been, and is not likely to be, an obstacle to it. The advent of the Continental members in 1924 has made its meetings even more interesting. Their presence will be explained later.

Primarily the International Board exists to control the Laws of the Game, that is to say, the code which applies to the actual play of the game itself all over the world. The members of the Board also come to certain agreements which do not amount to alterations or additions to these laws. For example, "An International Match shall not commence later than 3.30 p.m. except by the mutual consent of the Associations concerned"; or "In International matches the jerseys worn by both goalkeepers shall be of the same colour—deep yellow"; or "A professional who has been reinstated as an amateur shall not be eligible to play in Amateur International matches". These agreements are necessary in order that the different national bodies shall not unintentionally fall foul of each other's private arrangements, such as rules dealing with problems of professional and amateur status, dates of closed seasons, and so on, which are important, but do not directly affect the actual Laws of the Game. It is interesting that all five groups represented on the Board have given up any possible claims they may have had to full independent control of the Laws of the Game, in virtue of their membership of the Board. As long as it continues to exist and they continue to support it, the Board itself is the body which controls these laws.

V. THE F.I.F.A.[1]

British colonists and soldiers and sailors took football to all parts of the British Empire. Associations were formed in Ontario in 1882, in Manitoba in 1884, and a Canadian team visited England in 1888. The Natal Football Association was founded in 1882 and the Anglo-Australian Association in 1884 with its headquarters at Melbourne. The Indian Football Association was formed at Calcutta in 1883. The game was taken to the United States of America about 1875, but it did not make so much headway there as it did in Canada later. The American Football Association was founded in 1884. Football had also spread to Germany and Austria. It was played under mixed rules by German students, but in 1875 the Association laws were adopted by Lüneberg College, and this was the foundation of association football in Germany. In Belgium, Holland, Denmark, France and in other parts of Europe the association game was also widely adopted by 1900.[1] The British teams who played Continental teams seem to have considered themselves unquestionably superior even when they did not win, for they sometimes attributed defeat to long and tiring Continental travel, but they are willing to admit great improvement in foreign football of late years—a characteristically insular attitude, though possibly the facts are true.

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[1] Data about the F.I.F.A. were obtained from Pickford(16).

In 1904 the *Fédération Internationale de Football Association* was formed on the Continent at the suggestion of the French Union of Athletic Sports. This Union wrote to the Football Association in 1903, suggesting some such combination as the F.I.F.A. The reply was that the Council did not see the advantage of such a federation but was prepared to confer on all matters about which conference was desirable—a truly British reply and another piece of insular behaviour. As a result of doubts about the proper control of professionalism and about the adherence of the Continental players to the Laws of the Game, English delegates were sent to a conference at Berne in 1906. These delegates reported that a well-organized Federation was valuable and that The Football Association should play a constructive part in helping this body to develop Continental football to the best advantage. This co-operation was established and continued till the Great War brought it to an end. After the War attempts were made to set up a new organization excluding Germany and Austria, without success, and the F.I.F.A. continued with only a skeleton programme. In 1923, however, a conference was held in London, and as a result of this the British Associations joined the

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[1] The dates of the first international matches between various countries disclose some of the steps in the spread of association football all over the world since 1900 (12). Matches were played between Austria and Hungary in 1902, between Belgium and France in 1904, between the Argentine and Uruguay in 1905 and between Brazil and South Africa in 1906. In 1899 England played an unofficial match with Germany, and in 1908 many international matches on the Continent. Scotland played for the first time on the Continent in 1929, against Germany. In 1908 there was a match between Norway and Sweden at Göteborg; in 1910 between Denmark and England at Copenhagen; and in 1911 between Sweden and Finland at Helsingfors. Italy came into international football in 1910, by playing France at Milan; Spain came in 1920 and Portugal in 1921. In 1913 there was a match between China and the Philippines at Manila, and in 1917 Japan played China at Tokyo. In 1934 the Dutch East Indies played Japan at Manila. The U.S.A. played in the Olympic Games at Stockholm in 1916, and against Canada both at Montreal and at Brooklyn in 1925. Egypt played in the Olympic Football Tournament in 1920, and so did Greece and Jugoslavia. Rumania took part in the Tournament in 1922 and Bulgaria in 1924. In 1930 Cuba, Honduras, Guatemala, Costa Rica and Jamaica all took part in a big tournament at Havana. In 1937 there was a match between Central and Western Europe, and in 1938 the 75th anniversary of the foundation of the Football Association was celebrated by a match between England and the Continent at Highbury.

F.I.F.A. again on certain understandings about the rights of the International Board and about the avoidance by the F.I.F.A. of interference in the home affairs of its members. The F.I.F.A. was thereafter represented on the International Board by two delegates. This means that all the Associations united under the F.I.F.A. were represented together on an equal footing with England, Scotland, Ireland or Wales at this Board. The F.I.F.A. accepts the Laws made by The Football Association and altered and controlled since 1885 by the International Board. The *F.I.F.A. Handbook* (8) is published in English, French and Spanish, and in the English edition its Statutes and Regulations are printed in both English and German. English is the official language of the F.I.F.A., but speeches at its meetings are translated into French or German or English as required.

In 1927 there was a difficulty between the F.I.F.A. and the Committee of the Olympic Games, which wanted to control football at the Games, and the F.I.F.A. passed a resolution that it was itself the highest authority on all football matters and could not accept interference or guidance from outside. This caused some anxiety to the British Associations and to the International Board, because they did not wish to risk their independence by their co-operation with the F.I.F.A., although it was explained that the resolution was not aimed at them. However, the actual rift came in 1927, when the F.I.F.A. decided, in conference with the Committee of the Olympic Games in Paris, that payment for an amateur's loss of time should be recognized at the Games. The British Associations, determined to maintain a clear distinction between amateur and professional football, objected to this, regarding it as a form of sham amateurism, and withdrew from the F.I.F.A. At this point all the Associations again showed their very interesting capacity for compromise, because an arrangement was made by which the F.I.F.A. continued its membership of the International Board, though the British Associations are not members of the F.I.F.A. The F.I.F.A. accepts the International Board as lawmaker and has now established a World Cup Competition under its own control and having no connexion with the Olympic Games. The F.I.F.A. has a large membership of national associations from all parts of the world, but the British Empire Associations are affiliated to The Football Association. The Empire Associations pay affiliation fees only to The Football Association, but the other British Associations regard them as affiliated by these fees to Scotland, Ireland and Wales as well as to England, and do not ask for further fees. This again shows their capacity for compromise.

The position of Eire is very interesting, though unfortunate. When the formation of the Irish Free State took place in 1921, the Eire Association took the opportunity of joining the F.I.F.A. independently, and so lost its connexion with the International Board as part of Ireland. By doing this it became virtually a Continental Association and is represented on the International Board by the delegates of the F.I.F.A., and not as a British Association like that of Northern Ireland, which retained the title of the Irish Football Association, and continued to send two delegates to the Board. The Eire Association has now changed its name to the Football Association of Ireland, and it is very puzzling to the people on the Continent that this peculiar arrangement should exist. It is a hope of the future organization of international football that greater co-operation may be achieved than is now possible between the associations of Eire and of Ulster.

THE GENERAL FACTOR IN AESTHETIC JUDGEMENTS[1]

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I. *Previous investigations* (pp. 94–96).
II. *General plan of the present research* (pp. 96–98).
III. *Results and conclusions* (pp. 100–102).

I. Previous investigations

Several workers have recently been investigating the existence and nature of a 'general factor' in aesthetic appreciation. Dr Dewar has shown that both laymen and experts tend to put pictures of widely different merit in much the same order of liking; if their various rankings are correlated, and the resulting table factorized, we find that a large part of the variance is accounted for by a general factor (1).

Other investigators have shown reason to assume the existence of a general factor which would be operative not only within one test, but between tests of different kinds of aesthetic appreciation (even after the influence of intelligence had been eliminated). They found that "the capacity for literary appreciation correlates...with pictorial and musical appreciation" ((2), p. 283).

The general factor to be discussed here lies between these two factors, being more general than that discovered by Dr Dewar, but less extensive than that discovered by Williams, Winter & Woods. Admitting that there is a general factor appearing within any one test of visual appreciation, we ask if that factor would extend to all other tests of visual appreciation as well; or whether it would be specific to the one test in which it was observed.

Prof. Burt put the same question in the following form: "If we could brush aside all irrelevant associations, and take a completely detached view...would there be any solid grounds for preference left?" ((3), p. 289). Researches such as those mentioned above may seem to answer this question *a fortiori*, because if we admit the existence of an intersensory general factor, extending over literary and musical as well as pictorial material, the existence of a general factor for visual appreciation would seem almost inevitable. This argument is strengthened by the fact that Dr Dewar found that several different tests of visual aesthetic appreciation correlated together, even after the influence of intelligence had been eliminated.

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[1] A paper read before the British Psychological Society, 1 April, 1939.

And yet we feel unable to accept these results as finally settling the question raised by Prof. Burt. It would seem that the condition mentioned by him had not been fulfilled in these researches, viz. that all irrelevant associations should be brushed aside. The 'irrelevant associations', as they appear in the researches mentioned, are mainly of three kinds:

First, there is the influence of that complex of factors which we may call 'civilization'. Included here are teaching, tradition, general knowledge and all the thousand and one things that make up our cultural background. Dr Dewar's pictures, for instance, included "reproductions from classical masters, second-rate pictures by second-rate painters, every variety and type down to the crudest and most flashy birthday card" ((3), p. 290). Now it is easy to see that the influences mentioned above might exert an overwhelming force in favour of the 'socially accepted' pictures, such as the old masters, and against the 'birthday cards'.[1] Dr Dewar herself reports the influence of a factor of this nature (4).

Two minor factors working in the same direction we might call excellence of technique and familiarity. So far as technical excellence is concerned, the old masters in most cases are superior to the artists who draw the birthday-card type of picture, in the sense of being able to reproduce external objects more accurately. But preference on these grounds is not what we are looking for; we may prefer one photograph to another, not because it is superior aesthetically, but because the other one is technically imperfect—it may be out of focus, or underexposed. This is clearly an extraneous factor, whose influence should be minimized.

As regards familiarity, the attachment one forms so readily to things one knows well has often been remarked upon. When we encounter a picture we have seen before, or a picture painted in a familiar manner, the very fact that we have seen this picture, or a similar one, before disposes us more favourably towards it. The reaction against any new school of art is an eloquent witness to this contention.[2] At first, the unfamiliar is disliked; as it becomes more familiar, liking increases. This has been proved experimentally by Moore (5). (It is not maintained of course that this effect is invariable and certain in all circumstances.)

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[1] This would be true primarily with regard to the 'experts' from whose rankings the correlations are taken on which Dr Dewar bases her general factor.

[2] There is an interesting discussion of this point in Koffka's *Principles of Gestalt Psychology*, p. 347.

If these criticisms have any validity, we should be able to derive certain principles from them as regards selection of pictures free from these 'irrelevant associations'. The pictures used in experiments of this kind should fulfil the following conditions: No tradition or teaching should point to one of them as superior to the others; so far as execution is concerned, they should be roughly of the same degree of excellence; and they should all be equally unknown to the subjects. Only if these conditions are fulfilled can we regard any test as genuinely testing the question at issue.

II. GENERAL PLAN OF THE PRESENT RESEARCH

Within reason, the pictures selected for the present research comply with these three conditions. Eighteen sets of pictures were used altogether, each containing over fifteen pictures on the average. Nearly all of these were completely new to the subjects; even where they were not, no authority could point to one of them as superior to the others. The standard of technical excellence was uniform throughout each test. The sets used are described below:

Description of tests used in research on aesthetic appreciation

(1) *Portraits.* Thirty-two reproductions of comparatively unknown paintings by modern painters and old masters.

(2) *Emperors.* Fifteen photographs of statues of Roman emperors, taken from the British Museum.

(3) *Book-bindings.* Fifteen coloured reproductions of book-bindings, from the British Museum.

(4) *Claude Lorrain.* Twenty reproductions of pencil drawings by Claude Lorrain.

(5) *Blotters.* Twelve coloured photographs of 'Bathing Girls', used for advertising blotters.

(6) *Vases.* Sixteen coloured photographs of vases from the British Museum.

(7) *Masks.* Eight coloured reproductions of Malayan devil masks.

(8) *Japanese paintings.* Fifteen uncoloured Japanese paintings.

(9) *Ships.* Nine photographs of modern steamships.

(10) *Landscapes.* Twelve coloured landscape paintings by Japanese artists.

(11) *Sets.* Ordering the seventeen sets of pictures in order of liking.

(12) *Embroidery.* Twelve coloured reproductions of pieces of embroidery, from the Prince Albert and Victoria Museum.

(13) *Curves.* Twelve curves of mathematical functions, drawn in ink.

(14) *Statues.* Thirty-two reproductions of modern statues.

(15) *Flowers.* Fifteen coloured photographs of various flowers.
(16) *Pottery.* Twelve coloured reproductions of pottery from the East.
(17) *Plate.* Fifteen reproductions of pieces of silver plate.
(18) *Clocks.* Twelve reproductions of medieval clocks.

The eighteen subjects taking part in the experiment were drawn from various walks of life.[1] They included bank clerks, shorthand typists, painters, students, teachers, psychologists, and a Professor of Aesthetics. The number of subjects to be used was determined by the intercorrelations of their rankings; the object being to obtain an average ranking which for all practical purposes was equivalent to the 'true order', i.e. to the average order of the whole population. I have shown elsewhere on what reasoning the formulae used in this connexion are based, and that they can be applied to material of this kind (6). The average correlation between the average rankings and the 'true order' is 0·87, as is shown in Table I.

Table I

Tests	r_{ag}	r_{as}	$\bar{r}_{k\bar{k}'}$	$\bar{r}_{kk'}$	$r_{\bar{k}g}$	N
(1) Portraits	0·811	−0·005	0·40	0·16	0·88	32
(2) Emperors	0·810	0·232	0·51	0·26	0·93	15
(3) Book-bindings	0·661	−0·524	0·27	0·07	0·76	15
(4) Claude Lorrain	0·577	−0·277	0 40	0·16	0·88	20
(5) Blotters	0·571	0·480	0·40	0·16	0 88	12
(6) Vases	0·541	0·191	0·40	0·16	0·88	16
(7) Masks	0·478	−0·545	0·26	0·07	0·76	8
(8) Japanese paintings	0·461	0·074	0·39	0·15	0·87	15
(9) Ships	0·334	0·073	0·35	0·12	0·84	9
(10) Landscapes	0·327	0·163	0·49	0·24	0·92	12
(11) Sets	0·309	0·169	0·66	0·44	0·96	17
(12) Embroidery	0·244	0·152	0·33	0·11	0·83	12
(13) Curves	0·228	−0·503	0·52	0·27	0·94	12
(14) Statues	0·202	0·592	0·35	0·12	0·84	32
(15) Flowers	0·167	0·639	0·32	0·10	0·82	15
(16) Pottery	0·058	0·035	0·47	0·22	0·91	12
(17) Plate	−0·060	0·484	0·42	0·18	0·89	15
(18) Clocks	−0·287	0·397	0·30	0·09	0·78	12
Variance	0·206	0·137				
Average			0·40		0·87	15 6

r_{ag} = factor saturation, general factor.
r_{as} = factor saturation, bipolar factor.
$\bar{r}_{k\bar{k}'}$ = average correlation of individual rankings with average order.
$\bar{r}_{kk'}$ = average intercorrelations.
$r_{\bar{k}g}$ = correlation of average order with true order.

Having asked the subjects to rank the pictures in each of the eighteen sets in order of liking, one of two alternative courses was adopted to deal with these 324 rankings. The first was to correlate the rankings, factorize the resulting table, and thus obtain weighted saturation coefficients. This was done when there was reason to suspect that bipolar, secondary factors played an important part in the choice, as for example in the 'Portraits' test, where the variance of the second factor is as high as 15%.[1]

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[1] I should like to take this opportunity of expressing my gratitude to these subjects, all of whom devoted to the tests of this research a great deal of time and energy—four sessions of an hour each being the minimum time for testing.

In the majority of cases, however, a rough preliminary analysis showed no trace of a significant second factor, and then a simpler method was adopted.[2] The average of the rankings of each set was calculated, and each person's ranking correlated with this average, thus giving what might be called 'unweighted saturations'. Sixteen tests were found to contain no important secondary factors; only the 'Portraits' and the 'Statues' tests required to be fully analysed. The average of all the 324 saturations was almost 0·40; that is to say, on the average the subjects agreed to that extent with the average order. As each person's ranking contributes to the average order, however, the average saturation would be reduced to 0·34 (using a formula given by Garrett ((7), p. 460)).

The fact that these saturations are significantly positive[3] proves the existence of a general factor for each of the eighteen tests; it will be seen that so far our results bear out Dr Dewar's findings. But the factors are still not general in the sense we mentioned at the beginning; they may be specific to each of the tests, and not general from test to test. (As, for instance, a subject's score in an intelligence test may be specific to that test, and not allow any prediction as to his score in other tests.) To determine whether there is or is not a general factor of this kind, we may regard each person's (weighted and unweighted) saturations as his scores in the tests, and correlate the tests with one another. (Our procedure follows that of the intelligence tester, who correlates several tests and deduces factors from the pattern of their intercorrelations.)

The table of correlations can be factorized by means of one of the usual formulae; the factors running through the tests can be extracted, and an interpretation of these factors attempted on the basis of the experimental material. This method of dealing with the scores gives us saturations for the tests, showing how far they are saturated with the factors involved.

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[1] The influence of bipolar or 'type' factors in aesthetic judgements, their nature and relation to temperamental qualities, will be dealt with in a later article.

[2] I am indebted to Prof. Burt for suggesting this method. Also, I should like to express my gratitude to him for reading this manuscript, and making many valuable suggestions.

[3] Eighty-one out of 324 saturations were 0·64 or over. By chance, we should expect only 1 in 100 to be as large as 0·64, according to Fisher's method.

III. RESULTS AND CONCLUSIONS

In Table I are shown the results of a factor analysis of the correlations between the eighteen tests used in this research. Fig. 1 gives a geometrical picture of the saturation pattern of the two factors responsible for all the correlations, within the limits of the probable error. It will be seen that we are dealing, first, with a general factor accounting for 20·6% of the variance, and secondly, with a bipolar factor, accounting for 13·7%. Two tests have negative saturations for the 'general' factor, but these are extremely low and can hardly affect the generality of that factor. (The correlations between the two tests whose saturations are negative is only 0·089; this shows that we are not dealing with a genuine bipolar factor.)

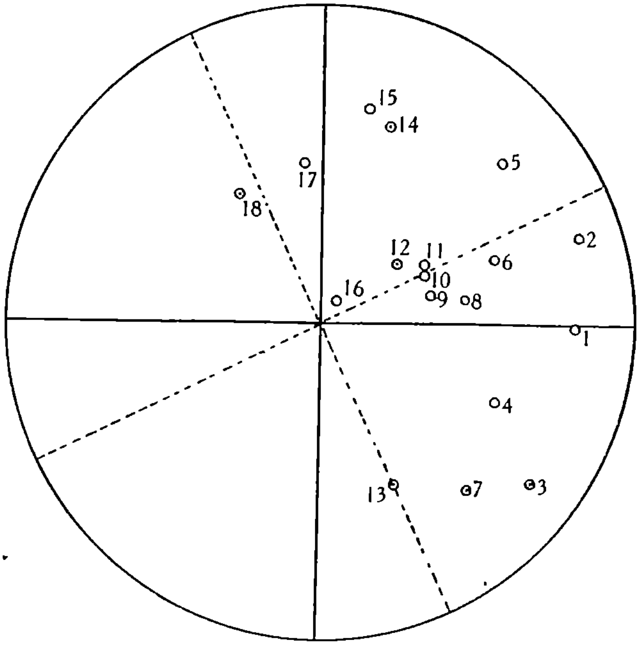

Fig. 1.

In accordance with Thurstone's principles (8), we should rotate the axes in Fig. 1 till no negative values are left for the general factor, and the number of zero saturations is maximal. This rotation is shown graphically in Fig. 1, but as can be seen this rotation would have little effect on the main results. In certain situations, rotation has the effect of eliminating the general factor altogether (9, 10), but this would not be the case here. The only effect would be a slight shift in the saturations for both the general and the bipolar factor.

Other results recorded in Table I are explained there. These values were calculated by formulae given by Burt (11); I have shown elsewhere that these formulae can legitimately be applied to data such as we are dealing with (6).

The nature of the general factor which we have found has already been indicated to some extent at the beginning of this article. It may be defined as the general, objective factor of aesthetic appreciation. We call it 'general' because it covers a large number of, probably all, pictorial tests, just as Spearman's '*g*' covers a large number of, if not all, cognitive tests. We call it 'objective' because, as has been shown, it is largely independent of individual taste. The word 'objective' has been used in this sense by Burt (3), Wells (12), and others; it is not here taken to imply anything with regard to the independent existence of the object. This is a philosophical question which cannot be dealt with in a psychological article.

But a few words may not be out of place with regard to the common-sense interpretation of the general factor. As applied to persons, this factor is the core of reality behind what is generally called 'good taste' (whence it has been suggested that this factor should be called '*T*'); as applied to pictures, it accounts for what we call 'beauty'; and finally, as applied to tests, it shows how good a measure of '*T*' each test provides. The 'taste' of a person can be measured by 'correlating persons'; the goodness of a test by 'correlating tests'; the relative 'beauty' of the pictures by calculating the (weighted or unweighted) average of the scores given to it by the subjects.

If the nature of the general factor is thus fairly clear, the nature of the bipolar factor is less obvious. It is possible to define its meaning by examining those tests which are most highly saturated with it. Curves, masks, and book-bindings have high negative saturations; flowers, statues, plate, clocks, and blotters have high positive saturations. An inspection of the pictures in these sets suggests immediately a dichotomy well known to aestheticians—that between 'formal' and 'representative' art.

Curves, book-bindings, and devil masks are formal in the sense that they are concerned mostly with relations of line, colour, or volume; the flowers, statues, blotters tests, on the other hand, are not so much concerned with these relations, but rather with the representation of external objects, e.g. human bodies, flowers, etc. This interpretation is supported by the introspective reports of the subjects.

Thus we have obtained experimentally a confirmation of a theory often advanced by aestheticians; Kant's distinction between 'free' and 'dependent' beauty(13), Porena's distinction between 'il bello immediato' and 'il bello di rapporto'(14), and the theories associated with the names of R. Fry(15) and C. Bell(16), all seem to emphasize the same dichotomy between what we called 'formal' and 'representative' art.

Both the general and the bipolar factor are more comprehensive than has been indicated so far. As this article is concerned mainly with the general factor, a discussion of the formal-representative factor must be left for a subsequent article. As regards the general factor, a number of the subjects whose saturations for this factor were known took part in further experiments involving the ranking of thirty-one odoriferous substances, of ten colours, and of sixty-four polygonal figures. In each case a general factor appeared when the intercorrelations of these rankings were calculated. When the saturations for these observers were correlated with their saturations for the '*T*' factor, the following results were obtained:

Odours and '*T*' = 0·75 ± 0·17
Colours and '*T*' = 0·53 ± 0·22
Polygons and '*T*' = 0·68 ± 0·15

(The number of subjects in these three experiments was eight, twelve and fourteen respectively. By Fisher's method, all but the second of these correlations are significant; the last is highly significant.)

It may be asked what possible meaning a factor can have that extends over such diverse objects as pictures, odours, colours and polygons. One might surmize that we are dealing here with a perceptual factor that derives directly from the nature of the nervous system; however, any positive answer to this question would involve too much speculation to be very helpful.

We have compared '*T*', the general factor of aesthetic appreciation, with '*g*', the general factor of cognitive ability. It may well be asked if these two factors are not at bottom one and the same thing, '*T*' being merely the manifestation of '*g*' when aesthetic material is used. In order to investigate this possibility, an intelligence test of the verbal type was given to the subjects,[1] and the correlation between '*T*' and the scores in the intelligence test found. With a standard error of ± 0·23, the correlation was only 0·25, i.e. not significant statistically. It seems, therefore, that '*T*' cannot be explained entirely in terms of general cognitive ability, even though from the results of other workers it would appear that there is a slight positive correlation between intelligence and aesthetic appreciation.

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[1] The test used has been described briefly by White(17).

Summarizing, we may state our main conclusions. First, evidence was found for a general, objective factor of visual aesthetic appreciation, which is independent of teaching, tradition, and other irrelevant associations. This factor is not identical with '*g*'. Secondly, this factor was found to extend over other modalities as well, correlating with a general factor derived from the ranking of odours. Thirdly, when this general factor was eliminated, a bipolar factor was found to emerge which seemed to divide the 'formal' from the 'representative' type of picture; a dichotomy lending support to theories long held by aestheticians.

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PUBLICATIONS RECENTLY RECEIVED

Selected Writings of Sir Charles Sherrington: A Testimonial Presented by the Neurologists Forming the Guarantors of the Journal 'Brain'. Compiled and Edited by D. Denny-Brown. London: Hamish Hamilton Medical Books. 1939. Pp. xiv + 532. 25*s.* net.

Psychologists all over the world will welcome this splendidly produced tribute to Sir Charles Sherrington. The book consists of a selection of extracts and full reprints from Sherrington's classical papers. It is, as the publishers say, both "a testimonial and a source book". The papers are arranged in historical sequence and they show the beautiful and impressive continuity of Sherrington's work. To read them is to catch again the excitement and enthusiasm of original discovery, carried out with magnificent economy of method, with continued and unfailing insight, and expounded with brilliance and clarity.

Naturally those who are responsible for this book regard it as having a primary appeal to neurologists and to students of reflex physiology. But in truth the appeal to the psychologist is no less, and the lessons which the psychologist may learn in the way of unswerving fidelity to the demands of scientific method, the use of fruitful hypotheses and the fascinating pursuit of problems ever opening into new problems, are probably more needed in his case than in any others. Even in a most direct sense this is for the psychologist a book to study, and to study again and again, for the principles of the organization of behaviour, illustrated and discussed by Sherrington at the reflex and near-reflex levels, are illustrated repeatedly at the more complex levels of conduct, and Sherrington's work is absolutely fundamental for an understanding of the more highly developed forms of behaviour with which the psychologist is immediately concerned.

Collective Behaviour. By Richard T. LaPiere. London: McGraw Hill Publishing Company. 1938. Pp. xiii + 577. 24*s.* net.

"Social Psychology", says the author, "still retains its youthful vigour, but it has now passed its troubled adolescence and has arrived at a mature understanding of its phenomena." It is doubtful whether many readers who succeed in getting completely through this text-book will be willing to endorse this view. Partly this is because unfortunately the author adopts a rather dogmatic style of presentation and relegates to Appendixes, which may go unread, many of his more interesting remarks and most of his illustrations. Also he has a sort of general scheme of headings which gets repeated again and again, so that, for example, leadership, ideologies, membership, overt and covert aspects of interaction, and many other topics, are discussed scrappily in a number of contexts and nowhere fully. Partly, however, reluctance to admit maturity will arise because obviously the present methodology of social psychology, as illustrated in this book, is totally inadequate to support the certainty with which sweeping views are constantly stated. A great amount of very valuable raw material is, in fact, collected together in the way of notes to each chapter, but this alone hardly justifies the size and extent of the volume. Any reader will find much to interest him, yet taking it all through, this must be characterized as another disappointment in a field where assertion has vastly outrun verification.

Psychology in Everyday Living. By F. F. POWERS, T. R. MCCONNEL, W. C. TROW, B. V. MOORE and C. E. SKINNER. London: George G. Harrap and Co., Ltd. 1938. Pp. x+511. 8*s*. 6*d*. net.

This is to be regarded as a text-book for the college student, meant to help him not only to pass examinations but also to manage his own life. There are five main parts: the Nature of Psychology, Understanding Ourselves, Adjustment to College and Life, Learning and Study, and Applications of Psychology. To each chapter are appended a number of questions and a list of references for further reading. The book, on the whole, is well informed and its summary accounts of a mass of very varied knowledge and research are good and reliable. It does not always, however, succeed in combining very well its two different aims of imparting useful hints for life and of inculcating specialized information. The ordinary student is likely to find it a little long and tedious in places, and more than a little platitudinous. When laboratory and research problems are being dealt with, however, the discussions are good, and will be found useful in conjunction with any well-designed practical course.

General Psychology. By A. R. GILLILAND, J. J. B. MORGAN and S. N. STEPHENS. London: George Harrap and Co., Ltd. 1939. Pp. vii+461. 8*s*. 6*d*. net.

The authors have produced a good straightforward elementary text-book. There is nothing particularly striking about it, and on a good many points of necessity rather dogmatic statements are made about disputable conclusions. Yet the arrangement is good, the emphasis strongly practical, and the ground covered adequate. As a first-year book in a general teaching course this could be a very useful book.

The Science of Psychology. By RAYMOND WHEELER. New York: Thomas Y. Crowell Company. 1940. Pp. xviii+436.

Prof. Wheeler has entirely rewritten the book first published about ten years ago, and it may fairly be stated that his exposition has gained considerably in clarity, in usefulness to the intermediate and advanced student, and in comprehensiveness. Some of the more debatable material of the earlier edition has been left out, though fortunately a good deal still remains. The author states his belief that "the main trend in psychology for some years will be to take to nature for testing, refinement and specialisation, principles, constructs, and laws conceived, as they always have been, during 'Law-making epochs'". He thus considers that much attention will be given to the predictive value of psychological research, and some of his most interesting remarks deal specifically with the various problems of making predictions. He is strongly convinced that predictive success is possible only on the basis of a thorough and scientific study of the principles of integrated behaviour in the animal and human organism. While in a way this may be treated as a general text-book, and gives a great amount of detailed information, it does not lose a somewhat personal and definitely thought-provoking quality. A good teacher can hand the book to good students confident that they will gain much from its discriminating study.

Human Development and Learning. By FRANK SEELY SALISBURY. London: McGraw Hill Publishing Company. 1939. Pp. xvii+513. 18*s*. net.

Human development and learning cover many things from pre-natal growth to aesthetic experience and the creative life, and 'the larger view' which appears to be another name for mankind's control of its destinies. It is a little difficult to know how to treat this book. It is got up to look like a text-book and much of it reads like one. But it is rather more than that. It expounds and illustrates a consistent thesis that life is all the time developing according to certain fundamental principles of differentiation and increasing complexity, and of the creation of new patterns of response. It is not strikingly original either in matter or in style, but it could be read right through with interest and profit by any good student. Such a student might well be attracted by the sustained effort to run the same basic ideas through the discussion of many problems which are often kept out of touch one with another, and he would very likely be helped to attain a point of view for the study of psychological problems for himself. The book is well produced, but its price seems excessive.

Psychological Issues: Selected Papers of ROBERT S. WOODWORTH, with a Bibliography of his Writings. New York: Columbia University Press (London: Humphrey Milford). 1939. Pp. x+521. 25*s.* net.

This book is issued to commemorate the attainment by Prof. Woodworth of his 70th birthday. Psychologists everywhere will welcome this attractive reprint of articles which are scattered in many different periodicals and books. They cover a very wide range of topics and are collected under the general headings of Systematic Problems; Abnormal Psychology; Differential Psychology; Motor Phenomena and Educational Psychology. The contributions also vary widely in length and in thoroughness of analysis, but even the most fugitive papers contain interesting and stimulating ideas. One can open the book and read anywhere, certain of finding observations of great interest and of stimulating import. The criticisms of contemporary movements, and there are several, are invariably both courteous and pointed. Prof. Woodworth shows himself most impressively as a psychologist of wide interests, with a somewhat rare combination of general critical and constructive capacity, a love of exact knowledge and skill in experiment. This will come as no surprise to the many psychologists in every country who already know and appreciate his work, but the evidence is all the more impressive for being collected into a single volume. It is a book that every psychological library should contain, and that good students everywhere should be advised to study.

The Innumerable Instincts of Man. By CLAUDE A. CLAREMONT. London: Eyre and Spottiswoode, Ltd. 1940. Pp. 196. 6*s.* net.

Mr Claremont writes so pleasantly and persuasively that he almost convinces us of his ability to elucidate that perennial controversy as to the nature of instinct in man. He takes the instinct to be a spontaneous activity—not a response to stimulation—dictated by a quite definite and purposive, but unreasoning, choice of actions. Each instinct is defined by its characteristic goal and by certain characteristic fixed actions necessary to the attainment of that goal; but the intermediate actions are variable and adapted to the particular circumstances (thus distinguishing it from a reflex). In the more intelligent animal the fixed actions are fewer and more widely spaced; there is greater foresight and more possibility of varying the intermediate actions in the light of intelligence. Man possesses, not a few broad types of instinct, as postulated by McDougall, but a very large number of specific instincts—developmental, as shown in the building up of the power of perceiving, moving, thinking, etc., social and reproductive.

Mr Claremont adduces in support of his theory many recent observations of instinctive activity in animals, and of the development of children as studied in Montessori schools. But, plausible as his suggestions may be, one cannot but help an uneasy feeling that a different selection of data might have been less favourable to his highly speculative theory. Nevertheless, this very readable book adds a valuable contribution to the exploration of a difficult subject.

The book contains no index.

Child Psychology for Professional Workers. By FLORENCE M. TEAGARDEN. New York: Prentice-Hall. 1940. Pp. xxiii + 641. $ 3.25.

During the last few years there has been an enormous outrush of publications dealing with a vast variety of problems connected with child development. Also far more books than the world needs have appeared of a very general, popular and advisory kind dealing with the difficulties of parents and of teachers. It is therefore of real value to have an excellent, judicious and factual account of the most important knowledge that has been accumulated in this field of research; and Prof. Teagarden's book ought to receive a welcome, not only from the professional workers to whom it is dedicated, but also from the general psychologist and from the intelligent reader who has a wide interest in the social problems involved in the care and training of children. The volume deals with a large range of questions, always with an eye to the facts but always also with a view to the extraction of whatever general conclusions are possible. Naturally it is concerned largely with deviations from normal development, but these are dealt with in a sensible and helpful manner. There are some very good bibliographies and a very good index. Although the book has a general practical aim of bringing together into one volume the most important findings of a great amount of research, Dr Teagarden manages to make a large number of valuable observations of her own, and maintains also a consistently interesting style of writing. Perhaps the addition of some concentrated and critical appreciation of the most fruitful lines of present study and research would have added still more to a book which, as it stands, should be widely read.

The Education of Backward Children. By M. E. HILL. With an Introductory Chapter by H. BOYES WATSON. London: George G. Harrap and Co., Ltd. 1939. Pp. 174. 5*s*. net.

The Southend Group Test of Intelligence. The Southend Attainment Test in Mechanical Arithmetic. By M. E. HILL. London: George G. Harrap and Co., Ltd. 1939.

The Education Authority at Southend-on-Sea is to be congratulated on its decision to tackle the problem of educating the backward child, and upon the manner in which this was done. In his introductory chapter, the Chief Education Officer describes the survey made of the scholastic attainments of cross sections, made at the ages of 7+, 11+ and 14 years, of the total Elementary School population. This gave an idea of the number of seriously retarded children in the schools who must be dealt with. The schools were then reorganized, so that, in time and in so far as accommodation permitted, at least one small special class of not more than thirty children was provided in the Infants, Junior and Senior Department of each school. As far as possible, specially trained teachers were in charge of these classes; and they were advised and supervised by the Educational Psychologist, Miss M. E. Hill.

In the remainder of the book Miss Hill gives a clear and interesting description of (1) the tests used for diagnosing retardation in Arithmetic and Reading, and for measuring intelligence, and (2) the methods of teaching employed in the special classes for Infants, Juniors and Seniors. As far as possible, the children's individual activity was encouraged, both in acquiring the basic skills, and also in the more generalized 'projects'; and in the youngest children, every opportunity was given for phantasy expression. Full details are given of all these methods, together with information about books, material, etc. These should be of the greatest value to anyone employed in teaching backward children. Moreover, the book is of general interest to the psychologist in demonstrating the thought processes of children retarded either through innate dullness or through emotional maladjustment.

Post-Primary Education in the Primary Schools of Scotland, 1872–1936. By NEWMAN A. WADE. London: University of London Press. Pp. xvi + 275. 8*s*. 6*d*. net.

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PROFESSOR McDOUGALL'S CONTRIBUTIONS TO THE SCIENCE OF PSYCHOLOGY (1)

By HERBERT S. LANGFELD
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CONTRARY to common opinion great men have usually been precocious in their youth, and McDougall was no exception. Before his first graduation in science from the University of Manchester at the age of 17, he was already acquainted with the writings of the leading scientists of the time. Not satisfied with having received first class honours at this provincial university, he entered St John's College, Cambridge, on a scholarship and continued to distinguish himself in his studies. During these eight years of intensive college work he laid the foundation for that vast learning which was evident in all his writings. At Cambridge he took a medical degree, not with the intention of practising but because he considered a medical training necessary for one desiring to study human behaviour scientifically. In this early conviction we see the germ of that endeavour to raise physiological psychology to the position of a dignified and productive science in England. That he did not remain entirely in physiology is probably due in part to the influence of William James and in part to something intrinsic in his own personality which caused him always to strive for the most inclusive view of human nature. That he should have been influenced more by James than by any other psychologist of the time is not surprising, since they had many attributes in common. They were both men with broad, cultural backgrounds. They had vivid and constructive imaginations, which enabled them to grasp important relations which often escaped the ordinary scholar. They had a contempt for those who split hairs over petty facts, with the result that their energies were always directed toward the most fundamentally important problems. They had a common dislike for the pedantic and purely academic, and were bored by the dry systematic German psychology. Finally, they both had a keen aesthetic sense, which was evident in the smoothness, fluency and lucidity of their literary style.

McDougall's first publication at the age of 26 was on a purely physiological problem—the structure of the cross-striated muscles and the nature of their contraction (2). A year later, however, he started to publish in the field of psychology, his first paper being upon psychological method (3).

1901 must have been an exciting year for the young scientist. He had the privilege of reviewing two works which had a profound effect on experimental psychology—Müller and Pilzecker's experiments on memory, and Titchener's *Experimental Psychology*. More important for him, however, was the publication of the report of his excellent work on vision (4), which marked the beginning of an interest in that field which lasted the rest of his life. He had first become acquainted with Hering's work during his undergraduate days through Rivers, who had studied with Hering in Germany. He soon found himself in disagreement with Hering's theory and decided to put the hypothesis to further experimental test. These were still early days in experimental psychology and the instruments were necessarily crude. All that McDougall had at his service were coloured glass and gelatine filters, and when he could not use sunlight, he had to resort to the flame of an oil lamp. Yet in this paper he reported the results of fifty separate experiments. As one reads the description of this extensive research, one is impressed with the keenness of McDougall's observation, with the ingenuity with which he varied the conditions in order to check the various assumptions of the existing colour theories, with his wide knowledge of the literature and his appreciation of the relation of his results to other aspects of human behaviour. He suspected the weakness of the Hering theory from the fact, as pointed out by Mrs Ladd-Franklin, that "approximately pure or simple" red and green are not complementary. Therefore, through experimentation, he proved to his own satisfaction the nature of colour mixture, and swung around to the Young-Helmholtz theory, or rather—through patriotic reasons, perhaps—to the Young version. He stated: "Young's theory,...if we incorporate with it the hypothesis of the separate W-exciting apparatus having its retinal seat in the rods, as urged by v. Kries, Rollet's theory of contrast and the theories of induction and after-images set forth above, explains fully all the phenomena described above; and, with the exception of certain observations of a complex character, very difficult to interpret, such as Müller's experiments on galvanic stimulation of the eyes and some of Prof. Sherrington's flicker experiments, I cannot discover any important fact connected with light- and colour-vision with which it is incompatible or that it fails to illumine." (5)

He also studied the mutual inhibition of visual images, and undoubtedly inspired in part by Münsterberg's action theory to which he refers, he examined the reinforcing influences of the activity of the ocular muscles. He saw the importance of the part played by the cortex in visual phenomena, and his eager mind went beyond colour theories to the more fundamental concept of inhibition.

McDougall always thought and wrote rapidly (though curiously enough he spoke slowly and hesitatingly, a characteristic due no doubt to his self-consciousness in social situations), and he was therefore able to publish a surprising amount of material. In the same year appeared his paper "On the seat of the psycho-physical processes" (6), a theoretical discussion based partly on his observation in the visual experiments. In it he argued that the synapses are the most readily fatigued parts of the cortical conduction paths, and that the amount of fatigue is related to the amount of neurin discharging across the synapse, and thus to the degree of potential in the system. The drainage theory, we see, was already beginning to take form in his mind.

In the year 1902 he wrote the first part of his famous paper, "The physiological factors of the attention process" (7), in which his drainage theory was described. In it he exhibits two trends which have always characterized his speculation, the one toward explanations in dynamic terms, and the other toward physiological principles. The drainage theory maintained that the simultaneous excitation of two nerve paths increases the intimacy of the connexion between the paths and facilitates the flow of neurin into the path most strongly activated.

Voluntary attention gave him trouble: He stated: "...while all attention involves concentration or convergence of free nervous energy from all or many parts of the brain into some one neural system, voluntary effort results in a further degree of this concentration of energy" (8). The increase of attention through voluntary effort, he felt, could not be explained through physical causation alone. He was not satisfied either with Münsterberg's or Ribot's theory of muscular response. Such responses in voluntary attention were not to be denied, but they were merely secondary manifestations of attention. Now McDougall was always an unwavering believer in the interaction of the mental and physical, a position which he most ably defended in the classic *Mind and Body*, and he felt that the psychologist must seek "in the insufficiency of physical cause evidence of psychical efficiency" (9). He therefore intimated that in voluntary attention we may have evidence of psychical guidance of physical processes. His drainage theory had accounted for the simpler manifestations, but even in this early period of his career such an explanation was too mechanistic to account for many of the higher processes of mental activity. The purposive aspect of life was taking hold of him. He pushed the mechanistic explanation as far as he thought it consistent with experience, and would then seek the aid of teleology. Yet he did not minimize the importance of the strictly causal relation of the physiological processes.

McDougall continued to work on visual phenomena and in 1903 published further data on the inhibitory processes (10). Again his equipment was simple—a spinning top, some visual patterns—but his conclusions were far-reaching. The observed brightness and colour contrasts, he felt, must be produced by inhibition, but existing theories such as Hering's, Verworn's, Wundt's and Gaskell's were inadequate. It seemed evident to him that the more intensely aroused processes tended to weaken the less intensely aroused through the process of drainage. But his scientific imagination did not stop here. In his own words, "...any sensory presentation or idea in becoming the object of attention, the central object of mental activity, causes any other object or idea to cease to be attended to. It is, therefore, clear that there obtains a relation of reciprocal inhibition between all those numerous organised systems of neurones or nerve-paths, the physiological bases of the mental systems, which have been built up through successive apperceptions (partly of the individual, partly of the race) to bring about appropriate reactions to every kind of object presented to the senses, or, as we say when the reaction is complex, appropriate conduct in relation to the object" (11).

Shortly after this paper appeared, 1904, the time seemed ripe for a psychological journal in Great Britain. The publication was named *The British Journal of Psychology*, and the editors were Ward and Rivers, the one a theorist, the other primarily an anthropologist. Seven of the nineteen papers of the first volume were experimental; five of them bore the name of William McDougall. We find from these articles that he was still primarily interested in visual phenomena and inhibition. The phenomenon of Bidwell's ghost he explained by an ingenious theory of intermittent nervous discharge, faintly suggestive of the refractory phase of nervous conduction. The fluttering heart illusion, that interesting experimental demonstration of the first decade of the century, gave him further ammunition with which to attack Hering and to support v. Kries's duplicity theory. From the results of his experiments on the latency of response of different wave-lengths, he concluded that there was little difference in their 'action times' if the colours were made to appear of equal intensity.

He accepted Helmholtz's explanation of the predominance of contours in the struggle between two visual fields as due to attention, but as we would expect he desired to describe attention in terms of the competition of nerve paths for the supply of free nerve energy. It is interesting to note his suggestion that his drainage theory furnishes an explanation of Sherrington's reciprocal innervation and inhibition.

In the same number of the *British Journal* he also described a method of studying concurrent mental operations and the resulting fatigue. His method was for the subject to mark dots which appeared on a revolving drum, the hand movements being recorded graphically. An arrangement similar to this became a familiar set-up in experimental laboratories and in work in the applied fields.

His *Physiological Psychology* (12) appeared in 1905. This little volume had only nine short chapters, four being on physiological processes and the others on perception and instinct, emotions, retention (including drainage), learning, and voluntary and ideomotor action; but the book was a godsend to the teachers of experimental psychology of those years that directly preceded the appearance of Charles Myers' *Textbook of Experimental Psychology*.

In 1908 he published with Hocart the results of his observations on auditory localization (13). He accepted intensity differences as the cue for localization, but as he believed these differences were often subliminal he favoured a local-sign theory. He did not fail to observe, however, that noises and complex tones are localized with surprising accuracy, a fact which he confessed was hard to explain by means of his theory, but which he probably would not have found so baffling if he had had the present instruments for regulating the phase, complexity and intensity of the tonal stimulus.

McDougall's active mind was always finding interesting situations for experimentation. In this same year he reported the results of his investigation of the colour sense of two of his children (14). He used a modified arrangement of Baldwin's method of having the infant reach for one of a pair of coloured objects, and found that the hues red, green and blue were appreciated at the age of six months, but that there seemed to be no real colour preference. The following year, 1909, he used his theory of fatigue, which he believed due to increased resistance in the synapses, to explain both neurasthenia induced by shock, and hysteria (15). In 1911 he applied his principle of drainage to the phenomenon of retinal rivalry (16), and in 1914, together with Flugel, he published "Some observations on psychological contrast" (17). He experimented upon the judgements of lifted weights, judgements of length of lines, of width of angles, of duration, and of the rate of seen motion. The evidence he obtained inclined him to accept Müller's theory of motor-set with reservations. He never really felt satisfied with an explanation entirely in behavioural terms, and so we are not surprised to find that he added perceptual set to motor-set.

Then came the war and his scientific work was seriously interrupted. In 1920 he appeared in a new field, that of learning and retention, when he reported a series of experiments made with the co-operation of Miss May Smith (18). The results convinced him that practice in memorizing produces both improvement in memory and in ability to commit to memory. In short, memory, as is widely recognized to-day, seemed to him to be a dynamic process and not the effect of mere repetition.

1926 saw him return to a defence of the drainage theory against an attack by Raymond Dodge (19). He admitted in this paper that he had been so long out of touch with physiology that he felt quite incompetent to discuss the topic. However, after reading Anrep's translation of Pavlov's work, he wrote in 1929, "...all of the many phenomena of inhibition so brilliantly studied and reported in this great work seem to lend strong support to the hypothesis of inhibition by drainage which I formulated 25 years ago..." (20).

In his student days at Cambridge University he rebelled against the prevailing and all-dominant theory of Weissmann which repelled him by its dogmatism. In 1920 while at Harvard he started that long series of experiments on successive generations of white rats in an endeavour once and for all to prove or disprove the Lamarckian hypothesis. In his last published paper on the experiment he wrote: "The future of this experiment is uncertain. I am an old man and a cripple, and cannot foresee the duration of the opportunities for prosecution of it which I still enjoy at Duke University" (21). Fortunately he will not have laboured in vain, for his son, Kenneth, is continuing the work.

Time does not permit a review of his extensive work in the abnormal field which resulted in one of the best text-books on the subject, or of his great interest in psychic research and kindred phenomena. I trust, however, that this brief account of his enormous productivity will convey some idea of his genius. Certainly his work speaks more clearly than anything I could say.

McDougall was a very firmly integrated personality. The pattern of his scientific thought was woven very early in his career, and he never broke one of its threads. If he accepted a theory, or formulated a new one, he defended it patiently and fairly against all attacks. The best example of this characteristic is his defence of the drainage theory which has been questioned by most of the eminent physiologists, and his rebuttals to the many criticisms of his Lamarckian experiments. He always believed in the interaction of the mental and the physical, and vigorously attacked Watsonian behaviourism when it was at the height of its popularity. He believed in purpose as a directive force and criticized most of the prevailing theories of learning, even that of Tolman. He agreed with the Gestalt school in its emphasis of the total situation, but the research which he did with his son, Kenneth, on the monkey, racoon, rat and wasp led him to assert that insight is not a sufficient explanation of animal behaviour. Until the Gestalt psychologists accept a conative guide by foresight, he said, their theory will remain mechanistic in the broader sense of the term.

McDougall distrusted any doctrine that was popularly accepted. He was therefore constantly pulling against the stream, but he fought with the faith of a crusader and with an indomitable courage and unswerving purpose that commanded the respect of all who knew him.

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THE 'TRIVIAL' AND 'POPULAR' IN PSYCHOLOGY[1]

By T. H. PEAR

From the Department of Psychology, University of Manchester

I. *Academic compared with non-academic 'triviality' and 'popularity'* (pp. 114–117).
II. *'Trivial' items in the dream and the psychoneurosis* (pp. 117–118).
III. *'Trivial' must be defined in some frame of reference* (pp. 118–119).
IV. *Comments upon some recent psychological publications* (pp. 119–121).
V. *Social psychologists' neglect of speaking* (pp. 121–122).
VI. *Do some branches of psychology afford escape for the introvert?* (pp. 122–123).
VII. *'Popular' psychological subjects* (pp. 123–124).
VIII. *Fifty years of change in American psychology; Prof. G. W. Allport's summary* (pp. 124–127).
IX. *Dangers of pseudo-austerity in the psychologist's mind* (p. 127).
References (pp. 127–128).

I. ACADEMIC COMPARED WITH NON-ACADEMIC 'TRIVIALITY' AND 'POPULARITY'

"'TRIVIAL'", says Webster's *Dictionary*, "is derived from Latin *trivialis*; that belongs to the cross-roads: hence, common, from *trivium*, a place where three roads meet." The first meaning, 'ordinary, commonplace, trite', is said to be obsolete or archaic. The second meaning given is 'trifling, petty, paltry'.

'Popular' means (1) pertaining to the common people; (2) plebeian, vulgar; (3) suitable to the public in general as (*a*) easy to understand, plain, as *popular* science, (*b*) adapted to the means of the common people, hence, cheap, as *popular* prices; (4) believed or approved by the people, as a *popular* leader. It is perhaps permissible to doubt whether meaning (2) is obsolete among psychologists in Great Britain.

In this article it will be contended that (*a*) in this country and in America during the last twenty years, many psychologists have avoided the 'trivial' and 'popular' so consistently that their studies are rapidly veering away from many valuable contacts with real life; that (*b*) in eschewing so-called 'triviality' they have created, developed and upheld categories of academic triviality, which threaten to become vested interests; that (*c*) avoidance of 'popularity', either as persons, speakers or writers, with the common people, is often linked with a fear of unpopularity with the ruling powers of science, especially of the physical sciences, and that (*d*) these tendencies threaten to dehumanize, emasculate and stultify psychology in general.

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[1] Substance of a paper read to the British Psychological Society's Birmingham meeting on 5 April 1940.

Some may object here that psychologists have no more right than anyone else to judge the triviality of a subject, for 'trivial' describes something which is to be compared with other things, against a context, background, or frame of reference. This is partly true. An insect bite is trivial if it does not happen to poison its victim—and to make this judgement needs no psychological insight. Historical instances are numerous where 'trivialities' have proved serious. Though historians love 'debunking' legends, we may perhaps believe that Captain Jenkins's ear and the alleged presence of pig lard in the Indian cartridges played some part in a war and a mutiny respectively. Yet some critics of psychology confidently set themselves up to judge what is 'trivial' in this study. They may be right, but I suspect that they are more firmly embedded in their own culture patterns than any psychologist ought to be.

Investigators employed by the British Institute of Public Opinion show how difficult it is to believe that at present our rulers, even our own political representatives, keep themselves well informed concerning many social matters which the majority of citizens consider to be of major importance. This fact has a practical as well as a theoretical aspect. Prof. J. D. Bernal(1) and Prof. Lancelot Hogben(2) maintain that the common acceptance of the point of view of the well-fed, comfortable, academic man leads to a state of affairs in which research into human relations, particularly in sociology and economics, is publicly tolerated only in so far as it has futility value, for if many of the recommendations arising out of these studies were put into practice, the economic repercussions would be considerable, and serious jars would be given to the delicate stratification of our social system; a stratification which, by the way, in its upper and middle layers, is mirrored in some English universities. We glimpse here the possibility that a subject which many academic people call trivial may, for that very reason, sometimes be regarded as having established a *prima facie* case for serious consideration by the practical minded.

An example of 'unacademic' university research was made famous by Dr Abraham Flexner in his *Universities, American, English, German*(3). A thesis for the M.A. degree in the University of Chicago was entitled

"A time and motion comparison of four methods of dish washing", and Dr Flexner made merry with this fact, causing titters in university common-rooms for years afterwards. Now if the actual investigation of dish washing had been observed in detail—I neither affirm nor deny that it was so observed—by Dr Flexner, it might have proved to be the reverse of trivial, though still, alas, popular. Dishes and the processes of cleaning them are common enough, but presumably the research aimed at understanding these processes and, consequently, improving them and eliminating from them unnecessary or fatiguing movements, or manipulations likely to break the pottery. In restaurants and canteens large-scale dish washing has been studied by the National Institute of Industrial Psychology. Serious breakages, both of china and of friendly relations, were substantially reduced by research into their causes. Moreover, dish washing lends itself to 'motion study', which, since it occasionally requires complicated and expensive apparatus, may appear scientific even to a natural scientist. In any case, the principles underlying motion study are significant for the physiologist or psychologist; a matter discussed by Frederick W. Taylor and Lillian M. Gilbreth, C. S. Myers and E. Farmer. Motion study may be admitted to have economic importance, since there have been serious and prolonged strikes about its use. Yet Dr Flexner submitted the 'list of Chicago theses' of the Department of Home Economics and Household Administration, including, presumably, the dissertation we are considering, to "two eminent authorities in the field of biochemistry and nutrition", for their opinion.

It may be objected that Dr Flexner's contempt was aroused by the fact that such a thesis was submitted for the Master of *Arts* degree, or that he was criticizing adversely the method, not the subject, of investigation. Be that as it may, in my experience, when English university teachers have deplored, sometimes rather pharisaically, the 'triviality' of themes for doctorate theses, in the U.S.A., dish washing has been the *leitmotiv*. So I think Dr Flexner's example may have been unfortunately chosen, even for his purpose.

II. 'TRIVIAL' ITEMS IN THE DREAM AND THE PSYCHONEUROSIS

But we have not merely to discuss whether Smith's idea of a 'trivial' subject is better than Jones's, and, inevitably, decide that there is no quarrelling about tastes. The problem is subtler than this. It is now forty years since Freud first maintained that the dream does not bother itself with trifles. He taught, moreover, that in the manifest content of a dream, an apparently trivial item may symbolize something very significant in the latent content, and that in waking life an apparently 'trivial' liking or phobia may do precisely the same thing. This is true of some 'autistic gestures', and of many instances of mildly pathological, even of healthy behaviour.

III. 'TRIVIAL' MUST BE DEFINED IN SOME FRAME OF REFERENCE

To use a flashlight momentarily in a darkened room with the blinds up may be a trivial act in the 'black-out', but in peace time this action would arouse justifiable suspicion in any policeman. It is a trivial act for an adult to enter his house after midnight, but not if he be an undergraduate in Oxford or Cambridge. The ceremonial of baptism; changing the guard outside a royal palace, the thousand and one details of the last Coronation are trivial regarded from many points of view, but not in the eyes of those who insist upon them. I believe that the almost non-existent interest of most psychologists in problems of clothing and speaking, and of fashions in them, is due to the fact that in universities both these subjects are regarded as trivial, except in the examples of wearing sports' millinery or speaking a foreign language. Yet in the everyday world, the man who has failed to secure an important appointment because of his unsuitable clothes or speech, and the woman whose small business is ruined by a sudden change in fashion, will regard these matters as tragically significant. The British War Office has found that such a trivial gew-gaw as the kilt seems important to many people, who wish it to be retained even when its wearer may be exposed to irritant gas or lice.

Psychologists, of all people, ought to be interested in the ways by which public opinion is formed. The apparently 'trivial' is often deliberately exploited by the publicist. Incessant reiteration in the newspapers and on the radio of 'trivial' facts about little-known people, is a well-known method of building up a 'public attitude', which will ultimately cause these persons to be regarded as important. More obviously useful is the technique of 'plugging' trivial news about important personages. Who believes, for example, that the numerous 'trivial' details about the lives of the Royal children had no effect on the average person's opinion of the present King and Queen?

'Trivial' must always be defined with regard to some value. This may be temporary and unusual, though none the less real and cogent. That on the morning I wrote this I was feeling cold is a trivial fact if you compare my experience with that of millions to whom the snow was causing agony. Yet if, being too cold to think about this article, I fail in my duty to my university or my family, the cold is trivial neither to me, nor to them.

Now for the obvious. Again and again, literary critics, nourished perhaps upon the wilder imaginings of some camp-followers of psycho-analysis, condemn a psychological book as containing 'obvious' facts about human experience or behaviour. Yet a textbook of zoology which omitted to mention, let alone describe, the obvious horse, dog, or frog in order to seem fashionably knowledgeable about pandas and okapis, would be condemned by scientists. Moreover, in psychology many 'obvious' statements are true only of a particular type of mind; for example, confident assertions, by non-visualizers, about the limitations of visualizers, or, to an introvert, the extraverted behaviourist's generalizations based upon his own often unnecessary meddlings with the outside world. It is safe to assert that to-day psychology requires many more careful records of unexciting events and facts. In this connexion, attacks upon what 'mass-observation' workers call 'academic psychology' seem justified, for many ways of behaviour, obviously important in a university, may have no parallel in Worktown, and seem trivial to its inhabitants.

IV. COMMENTS UPON SOME RECENT PSYCHOLOGICAL PUBLICATIONS

At the moment, I am puzzled by certain references to so-called 'trivial' matters in psychology. A recent effort by me (4) to describe some psychological problems of everyday life appeared to a reviewer (5) "at first sight popular and at times even trivial, but a second reading reveals considerable thoughtfulness in its preparation". This chapter, rewritten several times, and submitted for criticism to about a dozen social psychologists, treated of the following subjects: friendly relations between nations, social stratification, clothing, cosmetics, speaking, propaganda, the cinema, the radio, 'listener research', television, personality, unemployment, the attitudes of different races and nations towards each other, religious belief, conversation and war.

At the risk of being tedious, I will examine this reviewer's attitude, for I believe that the fashion among psychologists of not answering criticism, though it may preserve a rather queer form of personal dignity, is bad for psychology. To whom are the above-named subjects trivial? Possibly to a Trappist monk, a schizophrenic, and an old-fashioned type of university don, but to whom else? Is it the mention of clothing and cosmetics (a form of clothing) which shocked the critic? Yet can a psychologist who lives in the biggest textile area of the world, forget the connexion between clothing, economics, and politics? Surely there is social importance in the fact that nowadays to put on cosmetics will lose a woman one job, while to appear with an achromatic face will lose her another? And is there any connexion between personality, vocational fitness, economic success, individual happiness and social utility? One would have thought so.

If I mention another less severe review (6) of the same chapter, I fear that in England I may be regarded as having the bad taste to argue with the umpire. But I do this because in neither (unsigned) review has the judge indicated his own opinions; and those, at the present moment, might have helped me greatly. The reviewer says:

> Prof. Pear puts greatest emphasis on 'the social psychology of everyday life'; problems connected with unemployment, broadcasting, the cinema, propaganda and conversation loom largest amongst his suggestions. He has selected problems which he regards as 'especially important for psychological theory or practice', but unfortunately, he has not indicated at all fully where their psychological importance lies. As a result, his suggestions tend to seem arbitrary and at times verging on the trivial. This is no doubt due to the brevity of the article, and one wishes that Prof. Pear had spent longer in developing the wider implications of his problems and placing them in *proper*[1] perspective.

But as I see it, if I assert that psychologists are neglecting important problems of everyday life, and specify them, I am condemned as arbitrary. I will therefore become more assertive, and say that in the *Handbook of Social Psychology*, edited by Carl Murchison (7), a book of 1158 pages, the social problem of clothing might have been given rather more than two; about one-sixth of 1 %. The frivolous topic of cosmetics is actually mentioned here, though in a discreetly anthropological manner which will not harm the author's reputation in any university. The passage (which refers to clothing as a social custom) is this: "If a bit of mud is smeared on purposely, that would fall under this type of behaviour." Dr Clark Wissler concludes these two pages by adding (p. 550): "Space forbids further analysis of clothing and dress in its material, social and aesthetic aspect." And though this huge book is dated 1935, Prof. J. C. Flugel's *The Psychology of Clothes* (8) is not mentioned. Yet this *Handbook of Social Psychology* devotes 310 pages (27 % of the whole) to the social phenomena of bacteria, plants, insects, buds, mammalian herds and packs, infra-human primates, and the physical environment. The recent *Introduction to Psychology* (not, be it noted, merely to Experimental Psychology) by Boring, Langfeld & Weld (9), contains no reference to the undoubtedly popular (and therefore trivial?) subjects of War and Peace—and it was published in 1939. I feel that the verdict of the general public might be that my selection of subjects in that chapter was less arbitrary than the choices quoted above.

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[1] Italics mine.

V. SOCIAL PSYCHOLOGISTS' NEGLECT OF SPEAKING

I have already indicated that the study of clothing is neglected by most psychologists. A glance at the index of books of psychology will suggest that there is a similar taboo against the discussion of speaking. Probably the word 'taboo' is applicable here in its severely technical as well as its most popular sense, for while many thinkers are deeply interested in clothing and speaking as signs of personality, they are often reluctant to discuss them with reference to a particular person. I will challenge a reviewer once more, and once more only. In a notice of the present writer's *The Psychology of Effective Speaking* (10), the anonymous judge records that the book would be improved if it were "tricked out with fewer irrelevancies"[1] (no examples given), but adds: "A plea that the speaking of English should be taught in the schools deserves attention, however." Is this considered an almost irrelevant subject? The 'however' suggests it. But are the chapter headings in this book about subjects irrelevant to public speaking? They include: an examination of lectures and lecturers, particularly in universities, a discussion of spoken and written style, prejudices for and against dialect, a consideration of speech reform in view of the rapidly increasing importance of radio—admittedly a 'popular' subject, but hardly trivial. Were these irrelevances? Or was the chief irrelevance a chapter on the uses of humour in speaking? Possibly, for while it seems an axiom that psychologists may write of laughter, they may not, without losing caste, write about humour. Even Freud did not venture past a consideration of the joke.

At this point, some may try to dismiss the subject, saying that it is useless to dispute about tastes. I contend, however, that to-day it is at least useful to discuss them. Many psychologists to-day are, I submit, turning away from important psychological problems, and since social forces are largely responsible for this behaviour, discussion of them is significant and relevant, if unpopular. Indeed, it belongs to that neglected study, the psychology of psychologists. I beg to be allowed, in the next page, to utilize material from a recent article (11).

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[1] 'Irrelevant' joins 'trivial' and 'popular' as an epithet which expresses one's own views about psychology's 'frame of reference'.

As Prof. J. D. Bernal points out in *The Social Functions of Science* (1), scientists have lost their amateur status. Most psychologists nowadays are completely professionalized; a fact which inevitably influences the directions along which their science is developing. Study of the sociological setting of psychologists' activities, therefore, promises valuable results, for the development of all the sciences has greatly depended upon the idiosyncrasies of prominent workers, and upon the economic and social encouragement they succeeded in winning.

VI. DO SOME BRANCHES OF PSYCHOLOGY AFFORD ESCAPE FOR THE INTROVERT?

In his urbane summary of *A Hundred Years of Psychology* (12), Prof. J. C. Flugel, illustrating Dr Alfred Adler's belief that one's original inferiority in some respect may be converted into a superiority by constant exercise and effort, remarks:

> as when Demosthenes, the stammerer, became one of the greatest of orators, when Sandow, the weakling boy, became a recognized strong man of his day, or again, when a person gifted with exceptionally little insight into the thoughts and motives of his fellows compensates by becoming a psychologist.

I take this remark quite seriously. Not all psychologists like human beings more than anything else, or handle them unusually well. This raises some important questions. Are 'shy' psychologists common? Is their number increasing? If so, how will this influence the theoretical and practical development of the study?

In remarking that some psychologists like people, it is recognized that a few may love their fellow-men too much to judge them impersonally. Yet some forms of psychological judgement—perhaps all—are impracticable without sympathy, since the psychologist's task is to observe minutely, and describe accurately as well as to explain satisfactorily. To-day, for excellent reasons, psychologists are often immigrants from the older sciences. They may bring with them some attitudes common in these studies, including a distaste for intimate personal acquaintance. Connected with this fact, perhaps, is the claim that the study of mathematics purges the mind of sentimentality—even if in so doing it implants an over-ruling sentiment for mathematics.

I contend that a laboratory may be a refuge for thinkers whose affections for human beings is subnormal. Unsociable youths may leap at a chance to study man from the eyrie—or the ivory tower—of a laboratory instead of face to face in the real world, where they might be expected to show enthusiasm or sympathy, even to risk making fools of themselves, or appearing cheap in the eyes of austere scientists. This fear, therefore, is a sufficient reason for avoiding the 'popular'. I would go further, and ask, are modern psychologists afraid even to be interesting? Is there not an almost puritanical tendency causing many psychologists to avoid studying subjects of undoubted popular interest? This austere aloofness is not the prerogative of psychologists, yet together with anthropologists and sociologists, they have recently been criticized for neglecting their proper studies. The Institutes of Public Opinion in America and England, by their very choice of subjects to investigate, and the lively, even noisy, mass-observation movement in England, suggest that professional students of the human mind are fiddling while Rome burns.

In fairness to both sides, it might be pointed out that the day before these lines were written, *The Study of Society* appeared over the names of seventeen of the reproached ones. Yet many of these would readily admit that a large number of important and popularly interesting subjects are barely mentioned in this book.

VII. 'POPULAR' PSYCHOLOGICAL SUBJECTS

The meanings attached privately by academic people to the word 'popular', if examined closely, might explain some of this avoidance. Contempt for the common people is still widespread in many universities, though not so openly expressed as formerly. A recent interesting book about one of our oldest English universities expresses it explicitly in many places, and it would be dishonest to pretend that one does not hear it in ordinary conversation. It was even suggested recently at a scientific congress as a matter for serious study by an anthropologist.

There is, however, a subtler reason for this avoidance. I think it can be described as a belief that since a subject which interests everybody has no rarity value, he who writes about it will have no honour in his own country. For years everyone has known that millions of people, excluding ourselves, crowd in the summer to Coney Island and to Blackpool, yet a few *de-haut-en-bas* references to this weakness, as an illustration of men's gregarious instinct, were as much as the average social psychologist felt that these phenomena deserved. Recently, an account of mass observation was broadcast in Great Britain, and the usual comment was made (not, perhaps, with complete fairness) that the universities took no interest in it. A critic in one of our most democratic English newspapers immediately asked who could expect Oxford University researchers to be interested in what a shopgirl said on her holiday at Blackpool. Would Oxford be interested in an authentic record of what a slave girl in ancient Greece said about her mistress?

Some of the most striking omissions from general treatises on psychology seem to concern just those matters which make life interesting. Many a social psychologist seems conscientiously to have squeezed all cultural values, charm, wit and fun out of his raw material before he began work upon it. The films and the radio are two of America's chief interests, and their influence upon the success of fashions is very considerable. The radio may become the chief maker or breaker of the world's peace. Yet, so far, the number of psychologists regarding these as attractive subjects for study is very small. In some towns, England's early attempts at organizing people for air-raid precautions were made difficult by the social stratification of the inhabitants, but this subject is only beginning to appear in psychology books. Before the Great War, the idea of the inevitability of warfare seems to have been challenged by few psychologists other than William James, and to-day plenty of them seem to get along happily without bothering about such problems.

VIII. FIFTY YEARS OF CHANGE IN AMERICAN PSYCHOLOGY: PROF. G. W. ALLPORT'S SUMMARY

It might be thought that this criticism, even if justified, is directed chiefly at the work of British psychologists, who, after all, are few in number. Yet for several years it has appeared that something similar could fairly be said of our American colleagues' activities, taken as a whole. I felt, however, reluctant to indict a whole nation, but when the above-mentioned article of my own was in proof, I found that Prof. Gordon W. Allport had done it. His presidential address on 7 September 1939, to the American Psychological Association at Berkeley, California, is reprinted (13). He reminds his audience that, at a time when darkness has descended over the European continent, the burden of scientific progress in psychology rests as never before upon the membership of this Association. He continues:

> With the responsibility for the preservation and eventual rehabilitation of world psychology falling upon our shoulders, we do well to examine our credentials. Are we American psychologists equipped for the versatile leadership demanded by our comprehensive discipline; are we prepared to develop the potentialities of all its parts?

Prof. Allport then asks questions which, so far as I am aware, have not appeared in the publications of psychologists, in America or this country, for a long time. I might go further, and say that in some quarters they have been studiously avoided. One possible reason for this is that until very recently, the tendency to inquire into the social desirability of the activities of any particular scientist (I do not confuse the issue by deifying and therefore placing beyond criticism that restricted kind of knowledge which is called Science) has been unfashionable, especially among the investigators of inanimate matter. One of the earliest voices raised in warning about this reckless development of physical science, with little respect for its social dangers, was that of a psychologist, the late Prof. William McDougall, in *World Chaos* (14). This message, now nine years old, was that physical science has been the principal agent in bringing about the very rapid changes in our social, economic and political conditions which are the source of our present troubles, and that our only hope of remedy for them lies in the development of the neglected social sciences. The effect of this book upon English reviewers seems to have been infinitesimal. One of our most liberal-minded English daily newspapers, noted for its reviews, gave it rather less than one-fifth the space devoted on the same page to the second volume of a book on French wines.

Prof. Allport and Mr Jerome Bruner examined all the articles in fourteen published journals of psychology between 1888 and 1938 (13). They were the *Psychological Review*; *Journal of Experimental Psychology*; *American Journal of Psychology*; *Journal of Abnormal and Social Psychology*; *Journal of General Psychology*; *Psychological Bulletin*; *Journal of Psychology*; *Pedagogical Seminary and Journal of Genetic Psychology*; *Journal of Social Psychology*; *Character and Personality*; *Journal of Educational Psychology*; *Psychometrika*; *Journal of Comparative Psychology*; *Journal of Applied Psychology*.

It is thus possible to depict fifty years of change in American psychology. Among these changes, the following are important for the present argument. There has been a distinct alteration in the manner of attacking the higher mental processes (excluding perception but including learning). There is a decline in studies based upon language behaviour, as involved in learning, reasoning, concept formation, reverie or creative thinking. In 1908 they numbered 15 % of the total; in 1938 about 8 %. Corresponding with this decrease is an increase (5–14 %) in interest in maze learning in animals and men, conditioning experiments, and all other investigations of higher mental processes by means of non-verbal methods. "It is clear that the distinctively human function of language has a decreasing appeal for psychologists, even when the language expression is in the form of standardized tests (cf. (15)). The only increase is in those studies of higher mental processes conducted with animal subjects or with human subjects who for the duration of the experiment are rendered totally speechless."

Are we then to conclude that for American psychologists in general the act of speaking is 'trivial'? Or have they handed over its study to the physicist, physiologist and engineer? Are *Gestalt* psychologists content with the view that the atomistic attack upon speech, being inspired by views opposed to the belief in *Gestalt*, ought therefore to be allowed to die of inanition? Perhaps not entirely unconnected with this neglect of speaking and therefore of conversation is the next fact; interest in the single case has lessened. "Articles directed towards the understanding of the individual event, based upon intensive studies of clinical cases, individual persons, or single historical events, stressing the setting of the case in its life environment", i.e. views of the single case, used to be fairly popular; in recent years they have almost been ruled out of court. "We seem now", says Allport, "relatively uninterested in what the individual case can teach, or in checking our scientific scheme against the obdurate concrete event."

There is a decline in the percentage of contributions dealing with applied psychology as well as of those concerned with social betterment. In view of the flourishing activity of the American Association for Applied Psychology, and the Society for the Psychological Study of Social Issues, there is a distinct falling off in articles applying psychology to life, or pointing it in the interests of social amelioration. The conclusion to be drawn, he thinks, "is not that our membership as a whole is less interested in the usefulness of psychology, but that a certain professional cleavage is developing. Psychologists using the fourteen journals studied are, in their writings, becoming more and more remote from living issues, and more abstract in the presentation of their subject-matter. The consulting, applied and socially minded psychologists are turning to other more specialized journals. The indication is that 'pure' and 'applied' psychology are parting ways to some extent—an event which some will deplore and others welcome."

Allport next mentions the diminution of historical surveys.

"Whether the fault lies with the authors who no longer feel respect for past work or with the editorial guillotine that decapitates articles to fit our crowded journals,"

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he cannot say, "but as research accumulates in our archives it is cited less frequently in our current publications.

"Naturally, there is an increase in the employment of statistical aids and in the use of animal subjects in psychological research. Synoptic systems such as those of McDougall and Stern have given way to miniature systems, and embracing theories expounded in the grand manner have yielded to diminutive theories implemented with great precision. Immediate experience is rigidly excluded from most modern systems, and in its place surrogate operational functions are sought."

IX. DANGERS OF PSEUDO-AUSTERITY IN THE PSYCHOLOGIST'S MIND

I am anxious not to suggest by a single word that I consider any one of these special directions of psychology as useless or undesirable. I would agree with those who deprecate any immodest claims that psychology can be of use in regions where it is only just beginning. But I suggest that among psychologists in many universities, a pseudo-austerity of mind, safe for themselves but dangerous to the community, has grown up. Many psychologists are afraid of being regarded as vulgar, queer, or unsound by practitioners of the older sciences. This makes some reluctant to leave the frontiers of physics and physiology, and causes others to cling cautiously to animals. Yet the next generation, noting how few present-day psychologists were interested in unemployment, in social and national relationships, in friendship and hatred, how little they did to try to prevent or even to study war, how, fascinated with the measurement of intelligence, they took no interest in its wise direction, may consider many of the present researches childishly trivial, tragically irrelevant and deservedly unpopular.

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THE PYSCHOLOGY OF THE HISTORY AND ORGANIZATION OF ASSOCIATION FOOTBALL

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PART II

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VI. BRITISH PRESTIGE AND THE SPREAD OF THE GAME

It is very interesting to view the expansion of Association Football as an example of the transmission of a branch of ceremonial culture (cf. Bartlett (3)). If we draw distinctions between the transmission of culture by borrowing, by grafting and by intimate contact or blending of groups of people, then the expansion of football seems to have been an example of borrowing. If football had been imposed on peoples not accustomed to play any group games, as a ceremony rendered necessary or compulsory on account of ulterior motives, by politically stronger groups, then we should view its expansion as a form of grafting. If it had expanded, for example, in Britain because the Scotch, Welsh and Irish peoples had become culturally absorbed by the English and had lost their own identities as independent national groups, then its expansion would have been due to intimate group blending. It has not, however, expanded in either of these ways. It was developed among differing groups of people, such as the several British nations, and later the European and other nations, who did not become culturally identified, and none of which imposed football as an aspect of its culture upon the others from ulterior motives. It expanded because its fame spread and because small groups of players and enthusiasts visited or went to live in distant places and carried it with them. In this way it was transmitted from Cambridge to London, from London to the North of England, to Scotland, Ireland, Wales, and then to Europe and other parts of the World. No group which took it up was forced to play football as a religious, moral or political duty to any other group. Indeed it is clear that the greatest independence was shown by the North of England, by Scottish and other national groups. The Scots have never been willing to submit to English authority. They simply agree to play the same game. These groups all took up the game because it excited their interest and satisfied a need for group games in themselves.

Two very interesting problems arise at this point for social psychology. What was the prevailing social influence which spread the game from group to group; and why did the game not change beyond recognition in the process of transmission? In the transmission of cultural elements, ceremonial or material, there are usually great changes from group to group, and if there are no such changes it is usually important to ask why. We cannot lay down an unvarying law that cultural elements must change in transmission. We can, however, say that the degree to which such elements are likely to change or to be preserved depends on the balance of tendencies playing on those elements in their new settings. Since they always acquire a new cultural setting when they are transmitted, then they always come into the sphere of influence of a new group of active social tendencies. For example, the Christian religious culture complex has, as we can see from *The Green Pastures* (Connelly (5)), become modified in most interesting ways in passing into the sphere of influence of the culture of the American Negro. It has acquired certain qualities in its vividness and simplicity, and in the concrete details of its imagery, which no European or Asiatic Christian could possibly have invented by any stretch of imagination. It has been changed so much that we feel a special delight in seeing essentially the same ideas in such an astonishingly different guise. The drama of the Old Testament has been clothed in new garments quite inappropriate to Judaism, but derived from the Negro cultural context and tendencies and perfectly appropriate to these. This is a most interesting example of the transmission of a ceremonial culture complex and of the creative changes brought about in it by the play of social tendencies in its new setting.

In passing to China, the Argentine or New Zealand, however, Association Football has undergone no such dramatic changes. It has remained the same game in all essential details, and is played in these parts according to the same laws of play. The Islington Corinthians Football Club, between October 1937 and May 1938, sent a team on an extended tour of the World. This team travelled through Europe, Egypt, India, Burmah, China, Japan, Honolulu, America and Canada, and played nearly a hundred matches, and there was no difficulty as far as play was concerned, because the same laws were adopted everywhere. Indeed, they could not have made a success of such a tour unless Association

Football had been preserved from cultural change in the course of its transmission to these widespread places.

It is certainly true that there are and always have been differences between the kinds of football played in Scotland, the North of England, the South of England and other parts, but these differences do not amount to more than divergences of style. They do not affect the essential spirit or principles of the game, and do not prevent teams from different parts playing together. The Scots players have always developed short passing and dribbling the ball, as compared with the English method of long passing and fast running. It is safe to say that no Brazilian footballer, unless trained intensively in Scottish traditions—and probably not even then—could rival one of the great Scots players in footwork. This difference, however, would not make it difficult for a Scots and a Brazilian team to enjoy a match together. A Scottish player would not have the same degree or kind of difficulty in playing in a Brazilian team that an English bishop would have in trying to conduct a Negro Christian religious service.

The essential reasons why Association Football has spread so widely with so little change are simply that English and British prestige were strong influences in its cultural transmission, and the pioneers are still felt to understand the game best; and that the essential condition for the success of a group game like football is co-operative and competitive enterprise based on fair play. These two factors have ensured that the game should be passed on and at the same time preserved in its essential form according to the Laws and Rules of The Football Association. Of course, in Africa the natives may play barefoot, but that is only an adaptation suiting the game to people who have strong and capable feet. Groups which took up the game in the course of its wide expansion did so because of its reputation as a great game spread abroad by the British, who were pioneers in group games. These new groups tended to accept the supremacy of the British in athletics (19), and, since they were motivated by the desire for co-operative competition, they made no moves to assert their independence by alterations to the essential laws of the game.

These points are all of great interest because, in general, prestige alone does not seem to be able to preserve travelling elements of culture unchanged. If it was sufficient alone, then many practices and customs which have been introduced to native peoples all over the world by Europeans should have remained more constant than they have. In all likelihood transmission without change is more frequent the less there are already in the cultures to which the elements go, settings closely related to the incoming materials or customs. In Association Football an important additional factor seems to have been the need for widespread common understanding about the comradely and competitive enterprise. It is obvious that religious practices would be expected to undergo great change, in view of these arguments, because they usually meet with pre-existing religious practices in their new settings, and their transmission is often in part the result of active conflict with parent groups. British group games, however, seem to have had an open field in which to spread abroad.

VII. RUGBY AND ASSOCIATION FOOTBALL

Handling the ball has become the great distinction of organized Rugby Football, while in the Association game it is strictly taboo for the ball to be touched by the hand at all when in play, except by the goalkeeper. It is, however, thrown into play again when it has crossed the touch-line. The concentrations of interest on holding the ball and running with it, in Rugby, and on playing it only with the head or feet, in the Association game, are of great psychological interest. It might be said that in Association Football the ball is symbolically a very dangerous or dirty object, or that it is so powerful in unconscious meaning that it must not be touched with the hand under penalty for foul play. In Rugby Football the ball might be regarded as such a lovable object that every player tries to caress and hold it as if it were a valued possession. In psycho-analytic terms these attitudes suggest that, to the Rugby enthusiast, the ball is a symbol of loved maternal images, while to the Association Football enthusiast it is a symbol of paternal potency which is somewhat feared and requires special forms of taboo or control. These differences are born out by the importance in the Association game of control by laws and rules and on the hierarchical system of organization, which is, nevertheless, very democratic. In the Rugby game the ball is put upwards over the goal bar, while in Association Football it is kicked beneath the arch. These differences may carry the symbolisms of the ball further, because 'upwards' suggests purity and 'downwards' suggests the mastery of a rival. Shooting a goal in Association Football may also have a sexual meaning. On the other hand, the ball is kicked, headed and passed from player to player with loving care and skilful footwork in Association Football, and in the Rugby game the 'scrum' might be regarded as an ugly form of aggression and even as an undignified tussle for possession of the loved object, the ball. It is, therefore, easy for partisans of either game to represent the other as objectionable and inferior, but in fact each has its merits as a game. The two games provide opportunities for the gratification of very different tendencies in individual players and spectators—Association Football gratifies an interest in skilful footwork with a special taboo on touching with the hand, Rugby in handling the ball, and so on. The growth of divergence between the two kinds of game expresses the influence of strong social class distinctions, and it is an excellent example of what Bateson (2) has called 'schismogenesis'—the development of cultural traits in opposition and divergence instead of towards blending and unity. The divergence here was based upon class distinctions together with important unconscious meanings in handling the ball as opposed to footwork with a taboo on touching.[1]

At the meeting in 1863, when the supporters of the handling and carrying game withdrew, and left the formation of The Football Association to the men interested in the kicking and dribbling game, the representatives of handling had been instructed to insist upon hacking as an essential part of football. The insistence on hacking, which they thought to be essential, was really an unconscious excuse for the great division between the supporters of handling and those who upheld the taboo on touching the ball. It is an interesting example on the social level, of the way in which people are commonly found to act as they wish, but to insist on reasons which are not their real motives, which are unconscious. In 1870, when the Rugby Union was formed, hacking was given up in the Rugby game too. At first the divergence between the two kinds of football was not dependent on social class distinctions, but simply on traditions of school-play and on preferences for handling and objections to it. Later, Association Football tended more and more to become the game of the people, and Rugby the game of the upper middle classes and the English type of public school. Although both games emerged from the traditional background of medieval football, they have become sharply contrasted, and the contrast is of much social and individual significance. It is not comparable, however, with the distinction between two different games, like golf and cricket, and it has a far greater social and emotional importance. It is probably a general principle of social psychology that where two cultural traits, like Association and Rugby

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[1] This paper was read at a meeting of the Scottish Branch of the British Psychological Society, 3 December 1938. The importance of the difference in meaning between handling and kicking with a taboo on touching the ball was stressed in the discussion at that meeting, and was specially emphasized by Dr E. H. Connell.

Football, have recently diverged for emotional and social reasons from a common background, the opposition between their respective supporters is usually more acute than where two cultural traits are much less alike in superficial appearance and in traditional background. Religions which are diverging from a common basis are often bitterly opposed, while religions which have never been connected may exist side by side without conflict.

It is evident that the division of interest over Association and Rugby Football has been too great, from the start, to be overcome by the impulses which have made each game, and particularly the Association game, very uniform. While most of this article is about the tendencies which made Association Football a widespread and uniformly organized system, and which overcame threatened splits, it is very interesting to contrast these influences with the profound likings for handling the ball and for the taboo on touching, which were the basis for the divergence of cultural growth between the Rugby and Association games.

VIII. *MORALE* AND THE HISTORY OF THE GAME

The early forms of football seem to have been ceremonial combats, and it would be very interesting to investigate the unconscious meanings of the ball itself, which was, in some forms of the game, possibly a symbol of paternal authority and potency (see Elliot Smith (7) and Perry (15)). The early and medieval games were violent, and many of the players in them received serious injuries. In the nineteenth century the tendency was towards less violent games, and, when the Cambridge Rules were put together, hacking was given up for those who followed these rules, and a relatively gentle form of football established, in which skill took the place of violence. With the development of six-man football in the U.S.A., since 1934, a similar change towards the replacement of violence by skill seems to be coming in American football. "Regulation football's lasting glory has been due to the fact that it is basically brutal and elemental....The six-man game is the very opposite of regulation football...." ("Mr Football Becomes a Gentleman" (6)). Although the men who established the Rugby game broke away in 1863 in part because they liked hacking, this has not survived in Rugby Football, though certain other somewhat violent aspects of the early games have been retained in it.

Many incidents in the history of the Association game show that the impulses of fair play and of mutual consideration were important, not only on the field of play, but also in the council room. The capacity of the Football Association for compromise over the demands of professionalism, and over the problems of the Amateur Football Alliance, are illustrations. The freedom of the Scottish, Irish and Welsh Associations, and of the F.I.F.A., to control their own internal affairs, while they still adhere to the laws of play approved by the International Board, and their representation on the Board on an equal footing with The Football Association, though some might be regarded as more important than others, are further illustrations of the influence of impulses of comradeship in the control of the game. An obvious example of the influence of *morale*,[1] as contrasted with discipline, is the unwillingness of the F.I.F.A. to lose harmonious contact with the International Board, and of that Board with the F.I.F.A., in spite of differences of opinion about the definition of professional status of players in Britain and on the Continent. No rational or moral intentions of individuals, nor any dictatorial law-making, could have set up and maintained the existing harmonious organization of the game.

The Cambridge, London and F.A. rules and laws were established and adopted because many players needed some simple code which they could easily grasp and which would make fair play practicable and enable them to enjoy games together. They wished essentially for a practical understanding and to avoid quarrels and differences, both on and off the field, which might spoil the game. The Football Associations and the great organizations of League Football arose from the same essential needs, and the Associations and Leagues have their authority simply because football is a social institution in which a very large number of people want to enjoy their parts, either as players or as spectators. It is not surprising that people who did not accept and fall in with these principles have, on the whole, either had to keep quiet or to withdraw.

The essential principles can be summarized as follows: that football should be conducted for the advantage of the public, players and spectators, and not merely for private fame or gain; that where difficulties could not be resolved directly, it was better to compromise than to allow misunderstandings to interfere with the value of the game for the public; that no individual, club or association taking part in the game could be omnipotent or have the right to interfere with the private affairs of any other party. These principles all arose out of the essential comradely qualities of group games, and it is most unlikely that such principles could have been applied in the control of international football unless they had been essential to the game from the very start.

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[1] Cf. Bartlett (4) and Reaney (17). Patrick (14) advocated the recapitulation theory of play for American football.

A further aspect of group games, which is of the greatest psychological importance, though it could not be called a principle, is good humour. The social significance of good humour appears again and again in football, not only on the field of play itself, but among the spectators, and especially among the members of the organizing bodies, such as the International Board. Anybody who has joined the crowd at an International match, for example, Scotland *v.* England at Wembley, where national feeling rises to a high pitch of excitement, must realize that organizations, rules and laws would all be useless to achieve fair play unless the crowd took part in the whole proceedings with good humour. Again, the International Board might easily find its problems insoluble unless good humour were traditional at its meetings. This capacity for good humour makes social co-operation possible under the most trying conditions, and prevents the essential comradeship from vanishing at moments of stress.

Many people do not realize the futility of laws and rules in themselves to control a game like football, or human conduct in general. Laws and principles always have to be backed by some power derived from the impulses of human nature itself in order to be effective. In political organizations they are only too often backed by impulses of fear owing to threats of violence and punishment. In most problems of law and administration it is necessary to have possibilities of punishment in the last resort. This is very unfortunate. The extent to which a controlling institution is able to count on public support for its acts, without resort to punishment, measures the degree to which its members are controlled by *morale* rather than by discipline. Punishment is essential to discipline; fair play and good humour are the foundations of *morale*. The kind of flexible and democratic organization maintained by The Football Association would have been impossible on the basis of discipline and punishment, and it is in the organized group games that *morale* is most adequately developed.

The expansion of Association Football discussed in this article took place through the interaction of group and public interests with the influence of gifted men who were great leaders, through the intermediation of small groups consisting of clubs, associations and controlling bodies. It is difficult to discuss this very interesting three-cornered system adequately without analysis of the activities of well-known men some of whom are still living. It is commonly found that the relationships of men of genius, small controlling groups and the wider public setting are the foundations of social systems in which there is expansion and constructive change of culture. A great interest for social psychology in the history of Association Football is the dependence of the game on *morale* and impulses of fair play. Owing to these factors its history is a contrast to the history of religions, of political and artistic cultural movements, which usually show endless schisms and dissensions. The history of the game during the period discussed was under the influence of such men as Lord Kinnaird, Sir Charles Clegg, D. B. Woolfall, and the leaders who preceded, followed and worked with them. A new generation of leaders and the social changes of the mid-nineteenth century may bring unexpected developments in the game and its organization. The enthusiasm of the public for the 'Football Pools' may change the attitude of many people to the game, though the interest in betting is strongly disapproved by The Football Association. The war may bring many changes which we cannot at present foresee.

Outside the British Isles international football is taken much more seriously than the British tend to take it. However warm national feeling may be about international matches between the countries of the British Isles, it seldom reaches such a pitch of seriousness and intensity that the players and spectators are more interested in winning than they are in the game. When British teams go to play abroad it is often in the summer; then they are having what might be called a holiday, and they do not mind so much about winning as do their Continental or other opponents. Foreign enthusiasts find this very difficult to understand, and there are occasions on which even the all-important good humour vanishes. This is well illustrated by the story of the South American spectator, who is reported to have become so excited and angry that his side was losing, that he whipped out his revolver and shot the ball. Although international football is a most interesting sublimation of crude aggression, it has limited capacities in this direction. It has not proved itself a substitute for war, and in some European countries it is almost tending to become a direct expression rather than a sublimation of international rivalry. Then it is being taken too seriously.

If the principles of international football mentioned above could become traditional in wider spheres, many difficulties between peoples and nations might more easily be solved or avoided. The sort of *morale* developed in connexion with group games, which can maintain an international organization on the basis of fair play for everybody, compromise in place of aggressive insistence on differences of principle and the avoidance of interference with other people's affairs, is very important indeed.

The transmission of Association Football abroad with the minimum amount of friction and adherence to good principles of co-operative enterprise, is closely related to the democratic control of the game. This control became firmly established before the organization involved spread widely in foreign countries, and it therefore had prestige and the advantage of time in its favour. It is particularly interesting that the democratic control has not changed although the game has spread to countries the general character of whose political organization is autocratic or despotic. This may mean that democratic control is not impossible anywhere in the world on account of anything inherent in the method itself. Where it is superseded as a method of social rule by something more despotic, we should perhaps look for the reasons not inside the method of control itself, but rather in the spheres of culture concerned. Further, compromise, with occasional drastic action, does seem to be inherent in this form of control, but in the sphere of group games it does not wreck the method, whereas in other spheres it has done so. If this game was transmitted with lack of friction because The Football Association had already a very firmly established prestige before much spreading took place, then it forms an excellent illustration of the functions of social prestige in facilitating agreements between group and group.[1]

IX. POLITICS AND THE *MORALE* OF GROUP GAMES

In view of these points it is interesting to consider some further aspects of international football. For example, from the point of view of social psychology, it is very important to try to understand why international football has, on the whole, tended to be a sublimation of aggression rather than a direct expression of group conflict. Throughout their long history, from their ancient origins to the present day, football and the group ball games from which it arose have tended to be sublimations of aggression. They have taken up the social functions of substitutes for injurious and destructive conflict. They have been symbolic rather than actual fights. Medieval monarchs tried to suppress them because they deflected interest from war-making. How much better it would have been to have suppressed war because it interfered with football! Only where the essential principles of compromise, of good humour, of non-interference with other peoples' private affairs, and, in general, of fair play, have broken down, has football tended, as between certain European countries recently, to become the active expression of aggression.

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[1] For advice and criticism about this and other parts of the discussion I am much indebted to Professor F. C. Bartlett.

There are important and puzzling problems for social psychology, about the reasons for the breakdown of these principles. War often arises on account of precipitating causes (whatever may be its fundamental causes) which seem to depend on a failure of the same principles. It seems to be caused by failure of the parties concerned in a dispute to be able to compromise, by their tendency to interfere with each other's private affairs, by lack of sense of humour, or, in general, by incapacity for fair play. It is usual to appeal to reason when these principles break down, and to ask why one or both parties to the dispute cannot be moral and reasonable. No amount of appeal to reason and to public or international morals, however, will produce reasonable and moral attitudes by itself, where no tendencies for fair play and no sense of humour exist, or where they cannot be created. This is one of the great problems of psychology. The effect of appeal for moral and reasonable action depends not on reason itself, but on the fundamental psychological relations holding between the group or individual who makes the appeal and the individual or group which receives it. If the relationship is fundamentally one of antagonism, then appeal to reason may result in behaviour more unreasonable than ever. Reason and morality only seem attractive when they accord with fundamental motives, and some of these, in any personal or group relationship, are usually unconscious. This does not mean that reason and morality are only justifiable in the abstract when they seem attractive in the concrete; it means simply that they are not themselves motives, but are dependent on the deeper sources of human motivation.

International football has been fortunate. The success and interest of the game depends entirely on fair play and good humour. The public and players have usually been so interested in the game for the game's sake, that fair play and good humour have generally been possible in order that the game should have continued interest and success. Only under these conditions can it be a good sublimation of international aggression. There remain profound problems, however, about international politics, the battle-ground for innumerable ulterior motives, and in which no party is interested 'for the game's sake'. How could the methods of politics be modified to secure more sublimations of conflict than in the past, and to lead less often towards direct expressions of international aggression?

It is shown by the history of the game, that an important aspect of the development of Association Football, both national and international, has been the establishment of a tradition of reasonable co-operation in the place of downright aggression in the settlement of disputes and difficulties. Human social life is controlled by tradition to a remarkable degree. Conservative tendencies, which we may suppose to have the primary function of stabilizing social systems and cultural patterns, lead towards the formation of traditions which operate strongly in most spheres of social activity. These traditions, and their relations to social stability and to social change, are a very large subject of study, and they cannot be analysed in any detail here. It is possible, however, to say that the tendency to follow tradition is very strong in mankind, even though often opposed successfully by rebellious tendencies. It would be a grave breach of tradition in the organization of Association Football for any problem relating to the game to be settled by violence rather than by peaceful means. In fact, precisely because such use of violence would be a great breach of tradition, it appears an absurd possibility that any but a peaceful method should ever be adopted. We should be extremely surprised to hear that The Football Association Council had been forced to agree to a change of which they disapproved in the Laws of the Game, under threat of being shot if they refused. It would be equally amazing if, for example, the referee at an International match between England and Scotland should be forced at the point of the bayonet to grant a winning goal to either side. Such astounding breaches of tradition would be strongly opposed. The public would not take a rational view and give such possibilities their serious consideration. It would not be questioned whether the adoption of these violent methods might bring unfortunate changes in the constitution of the Association, and in the kind of organization which is customary in football. It would not even be questioned whether the public might possibly approve of such methods. The public interested in football would certainly reject them straightway, without giving them any consideration whatever. Opposition to such methods, or even to the threat of their use, would be made solidly by all supporters of the game. The possibility of such methods can be expressed to us intelligibly only in the form of a joke (see "The Ten Little Referees," Pickford (16) p. 100).

In contrast with this, it is worth noting that potential threats of resort to violence are always in the background in international politics. Sometimes such potential threats materialize into serious warnings, and sometimes they become real threats of war. Only too often it has been necessary to resort to war or threat of war in order to secure peace. In international politics, we might say that it is traditional to resort to war as the ultimate and supposedly satisfactory method of solution of major problems, and that war has been traditionally glorified as an ultimate measure in the settlement of disputes. The future hopes of world peace seem to depend at least in part on the capacity of the peoples concerned to change this tradition of ultimate resort to war. The Football Association never had to face such a problem, because the game was relatively unorganized while it was traditionally violent, and the Association, the International Board and the F.I.F.A. came into existence because of the rising public interest in the co-operative and peaceful organization of the game. If an international organization could come into existence equally spontaneously with the development of the Football Associations, because of a rising public interest in the peaceful settlement of international disputes and problems, and could command the support of all the great powers concerned, then war might become the method of settlement to be traditionally avoided in the future.

It is not, however, likely that such an international organization could ever be created with success artificially, or as a result of the defeat of its opponents in a previous war, or unless it could win the whole-hearted support of all the important national powers concerned.

In connexion with this problem, we must observe that it is often extremely difficult for an arrangement which has proved quite workable in one sphere of culture to be transferred to another. This may be a particular form of the very difficult problem of the transfer of training, appearing in a social setting. It is a question whether methods of social organization and control which have been evolved for football could be transferred to political and other spheres; whether, if people acquire habits of co-operation in group games, they will be made more co-operative in politics. The real difficulties in such a transfer are probably emotional, and are not concerned purely with the psychology of motor and cognitive learning. The emotional meanings of group games, which lean predominantly towards the sublimation and limitation of aggressive impulses by *morale* and fair play, may contrast too sharply with the chief meanings of political interests, which have been predominantly aggressive in the past, for much transfer of training to take place. The traditional British interest in group games, and their traditional ability as colonists and organizers, may spring from the same fundamental source.

X. CONCLUSIONS

A brief account has been given of the development of organized Association Football in England, and of its expansion in Great Britain, Europe and other parts of the World up to the outbreak of war. Many changes may take place when football is resumed in its normal way after the war is over. The impulses of fair play seem to have had tremendous importance in the development of organized Association Football. The change from the violent games, which were its forerunners, to regularized football, was essentially due to the growing public desire for harmoniously organized group games of interest to spectators as well as to the teams and their immediate supporters. Group games such as football are symbolic rather than actual combats between teams whose 'sides' are represented by the spectators who enjoy the game with sympathetic interest. A very high degree of individual skill is called for in such games, together with an equally high degree of co-operative team work. The team work is by no means confined to the individual teams taken singly; though each of them wishes to win the game, and they are not on that account merely opponents. The team work involves both sides in a double team whose object is to have a good game. Association Football also calls for a high degree of public organization, of which the purpose is to maintain the standard of play, to ensure that the teams which meet in the field are well matched, and to arrange for co-operation between all the many clubs and associations and between the national groups interested in promoting football.

It is of great interest that Association Football has spread widely by a process of cultural borrowing from group to group. In this it has undergone surprisingly little change, as compared, for instance, with the changes religious and artistic culture complexes usually undergo in the course of wide transmission. This lack of change is probably due to the predominance of British prestige in its transmission, and to the prominence of the impulses towards fair play and the *morale* of group games. The main desire in international spread of the game has been for co-operative competition rather than for direct conflict and the consequent separation and cultural divergence of groups.

The histories of The Football Association, the International Board and the F.I.F.A. show that the fundamental nature of the public interest in the game has enabled these bodies to conduct their affairs, and especially their international affairs, without resorting to threats, violent measures, and schisms. They have contrived to meet their most difficult international problems in a spirit of compromise, with humour, without interfering with each others' private affairs, and in such a way that the public was considered before private gain and personal glorification. These principles have been maintained because men were inspired by the fundamental co-operative nature of the group game, and not because they set out deliberately to try to be moral. The result has been the establishment of traditions of fair play and co-operative methods of international organization, such that any other methods or principles would now be solidly opposed by the public as absurd because contrary to tradition.

It is of great interest to consider how international politics might be made to follow the same principles and how the same traditions of the avoidance of the threat or actual use of violence might be established in them. This might be possible if the great international powers could spontaneously become interested in co-operation for the benefit of mankind rather than in the glory and success of one party at the expense of others. It is essential that such co-operation should be spontaneous, and not forced upon a loser by the victory of his opponent. It is not likely that such co-operation will be achieved by the efforts of deliberate pacifists, though they might contribute to the necessary change in political traditions.

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FURTHER DEVELOPMENTS IN A NEW APPROACH TO THE TESTING OF MUSICAL ABILITY, WITH SPECIAL REFERENCE TO GROUPS OF SECONDARY SCHOOL CHILDREN[1]

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I. INTRODUCTION: SCOPE OF THE EXPERIMENT

THIS paper may be regarded as a continuation of an investigation reported in a previous issue of this *Journal*(4). The present study was undertaken with two main purposes in view: (i) to extend the method of music testing already tried with adults to secondary school children, and (ii) to devise, if possible, a test of musical taste on similar lines to those of the test of musical understanding which formed the subject of the earlier investigation. From the results it was hoped it might be possible to draw conclusions regarding the existence or otherwise of an innate unitary musical factor or ability, as distinct both from a group of more specific abilities, and from proficiency or knowledge attained as a result of musical education.

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[1] Based on a paper prepared for delivery at the Dundee meeting of the British Association for the Advancement of Science, 1939.

The choice of subjects for the experiment was determined partly by convenience, and partly by the conditions of the previous experiment. Since the subjects in that case were nearly all University students, it was decided to take as closely similar a group as possible, and to confine the investigation to age groups within the secondary schools proper, so that the method and material would require the minimum of alteration. Permission was obtained from the heads of three schools to test top divisions of the first three years of the secondary department, these children being regarded as typical of those most likely to embark later on University studies. The schools chosen were fairly representative of the educational background of Edinburgh University students—one boys' school, one girls' school, and one mixed school under the auspices of the Education Committee. The four groups thus formed are referred to in what follows as B (boys), G (girls), mB (mixed school boys), and mG (mixed school girls). In all, 270 subjects took part, ranging in age from 11 years 7 months to 16 years 7 months, but for practical purposes the group consisted of children between the ages of 12+ and 15+ inclusive.

II. TESTING PROGRAMME

The testing programme comprised the following: (1) and (2) tests, as already stated, of musical understanding and of musical taste, in which impressions received on listening to gramophone records were noted on specially prepared blanks; (3) a simplified version of the 'Revised Kwalwasser' test described in the previous paper, entitled "George Combe Test of Musical Knowledge (J)"; (4) in the case of one school, a list of marks awarded by the music teacher for the work which the children had done for her was obtained.

A detailed account of the test material follows.

(1) *Test of musical understanding*

The nature of this test will be clear from the following instructions, which were printed at the head of the test blanks:

> You will be asked to listen to a series of gramophone records. After each has been played, answer the question printed opposite the number of the record, by underlining the word or phrase which you think gives the best description of the music. Explanations of some of the more difficult words are given on the page of notes, under the number of the record. You are also asked to say whether you liked each record or not. The answer should be put on the dotted line after the number of the record.

The records used were selected from those of the previous experiment, those records being chosen which appeared to be most suitable for the juvenile group. The following is a list of the records used in this instance:

1. (A2) Lieurance (arr.). *By the waters of Minnetonka.* (Cherniavsky Trio.) Col. 3368.
2.† (A3) *Volk ans Gewehr.** (Band and Male Chorus.) HMV. EG 2775.
3. (B4) Chaminade. *Sérénade Espagnole.* (Violin: Bratza.) Col. 5466.
4. (B6) Saint-Saëns. *Carnaval des Animaux: Tortues.* Col. 9519.
5. (A4) Saint-Saëns. *Carnaval des Animaux: L'Éléphant.* Col. 9519.
6†. (A1) Mozart. Minuet from *Don Giovanni.** (Harpsichord and Orchestra.) HMV. DA 977.
7. (A5) Sibelius. *Finlandia.* (Symphony Orchestra.) HMV. DB 1584.
8. (B2) Briccialdi. *Il Vento.* (Flute: Amadio.) Aeol.-Voc. R. 6024.
9. (B1) Knipper. *Song of the Plains.* (Choir of the Red Army of the U.S.S.R.) Col. DB 1749.
10†. (A9) Debussy. *La Fille aux cheveux de lin.* (Violin: Heifetz.) HMV. DB 1246.

Numbers in brackets indicate the series and serial number in the previous experiment. In two cases (marked *) less than the whole record was played.

The page of notes contained easy explanations of every word or phrase which might conceivably cause difficulty. This expedient was adopted to avoid possible loss of time through answering questions. Some slight changes were also made in the form of question as printed on the test blanks, but in general a policy of minimum change was adopted. Only in the cases of selections marked (†) was any change made in the actual alternatives offered, and these changes, too, were slight. As a result, a direct comparison was possible between scores made by school children and those obtained on the same items by the adult groups.

(2) *Test of musical taste*

The method used for this test was based on a technique described by Trabue (5) in a report of a little-known experiment by M. L. Mohler. The test blanks used bore the following heading:

> Gramophone records will be played in groups of three. In each group, the first record played is called A, the second B, and the third C. After each group of three has been played, decide which you liked best, which next best, and which you liked least. Then put a figure 1 in the column headed by the letter corresponding to the record you liked best, a figure 2 in the column corresponding to the record you liked next best, and a figure 3 in the column corresponding to the record you liked least.

In the Mohler-Trabue experiment only recordings of orchestral music were used, but for a variety of reasons it was thought preferable to include piano and violin works. Accordingly, three groups, each consisting of three records, were played: Group I, orchestral records; Group II, piano records; Group III, violin records. Unfortunately, it was not found possible to determine the relative merits of the works in each group by as extensive and rigorous a procedure as that described by Trabue, but the records were chosen so that each group should contain one acknowledged masterpiece of its own kind, one definitely ephemeral piece, and one of intermediate merit. The further precaution was taken of choosing as 'second-best' items, in cases of doubt, works which would not make so direct an appeal to the non-expert listener as would those graded as 'best'. It was considered that this device would have the same effect as the Mohler-Trabue procedure of averaging the judgements of 'expert' and 'non-expert' subjects.

The following is a list of the records used. Numbers in brackets indicate placings for merit (1, 'best'; 2, 'next best'; 3, 'worst'). Only the second sides of the overtures in Group I were played.

Group I. Orchestral.

A.	Mozart. *Magic Flute* Overture. Parl. E 10750.	(1)
B.	Romberg. *Viennese Nights: Introduction* and *I bring a Love Song.* Col. DX 208.	(3)
C.	Boieldieu. *Caliph of Baghdad* Overture. HMV. B 3482.	(2)

Group II. Pianoforte.

A.	Grieg. *Feuille d'Album.* (de Greef.) HMV. D 1825.	(2)
B.	Chopin. *Waltz in D♭ major,* Op. 70, no. 1. (de Pachmann.) HMV. DA 761.	(1)
C.	Young & Petkere. *Dancing Butterfly.* (Raie da Costa.) HMV. B 4477.	(3)

Group III. Violin.

A.	Kreisler. *Caprice Viennois.* (Kreisler.) HMV. DB 1091.	(3)
B.	Brahms. *Valse,* Op. 39, no. 15. (Spiwakowsky.) Parl. 1414.	(1)
C.	Tchaikovsky. *Melodie,* Op. 42, no. 3. (Elman.) HMV. DA 1143.	(2)

The ratings were checked by carrying out on a small scale the standardization procedure described by Trabue. The judgements of a group of eighteen adults and four juveniles of over 16 years of age were averaged, and relative values of the records in each group were calculated from the formula $(x-y)/2n$, where $x=$ number of times a given record was ranked above either of the others in its group, $y=$ number of times it was ranked below either of the others, and $n=(x+y)/2=$ number of persons participating.

Values thus obtained vary between $+1$ and -1. The values are given in Table I, and it will be seen that they agree completely with the ratings originally assigned.

Table I. *Relative values of records in test of musical taste*

	A	B	C
Group I	+0·32	−0·36	+0·05
Group II	+0·18	+0·45	−0·64
Group III	−0·45	+0·64	−0·18

Scoring of this test was carried out according to the system advocated by Trabue. Two points each were given for placing the 'best' and 'worst' records correctly, and one point for placing either of these in the mid-position. This gives a possible score of 4 for each group, and no possibility for scoring 2 on a single group. Scores obtained by this method can also be interpreted in other ways, and the method appears to be logical whichever way one considers it. Chance expectation of total scores for three groups gives the following distribution, which will be seen to be approximately normal, except for a drop in respect of the mid-category:

Score	0	1	2	3	4	5	6	7	8	9	10	11	12
Proportionate frequency according to chance	1	6	12	14	27	36	24	36	27	14	12	6	1

(3) *Test of musical knowledge*

As in the case of the experiment with adults, it was considered desirable to obtain a measure of the musical status of the subjects—of how much they knew about music generally. Since the writer's revision of the Kwalwasser test was too difficult for school children, a new test was devised. This consisted of five sub-tests, containing in all twenty-eight questions, to some of which two points were allocated. Table II briefly analyses this new test, together with the 'Revised Kwalwasser' and the original Kwalwasser test (1).

Table II. *Contents of tests of musical knowledge*

Test ...	GC(J)		RK		Kw	
Type of question	Test no.	Possible score	Test no.	Possible score	Test no.	Possible score
Nationality of composers	I	5	I	10	2	20
Classification of composers	II	5	II	5	4	10
General knowledge of composers and compositions	III	8	III, IV	27	3, 5	80
Classification of instruments	IV	8	V, VI	11	6, 7	20
General knowledge of musical theory, etc.	V	9	VII, VIII	27	8, 9	100
Classification of artistes	—	—	—	—	1	20
Total		35		80		250

Of the five sub-tests, only one (test III) involved scoring on the (Right − Wrong) principle. All the sub-tests, although modelled for the most part on the Revised Kwalwasser, consisted almost entirely of new items. In test V, in particular, considerable variety in the type of response was introduced, thus making the test more attractive to children.

Intercorrelations of the sub-tests, based on 210 cases, and thus all with a nearly uniform probable error of about 0·04, were as in Table III. These, it will be seen, are all low, positive, and (all but one) significant, as was to be desired.

Table III. *Test of musical knowledge: intercorrelations of sub-tests*

Test	II	III	IV	V
I	0·43	0·27	0·18	0·14
II	—	0·35	0·20	0·33
III		—	0·11	0·23
IV			—	0·26

(4) *School attainment*

Correlations were calculated between the various measures and school attainment in music, but since not all the groups could be studied in this way, and since school marks are both highly unreliable and difficult to interpret, no account has been taken of these in the present report. It may, however, be of interest to note that the obtained correlations were of a very similar order to the others found (mainly low and positive), and seemed to throw little light on the problems in hand.

(5) *Administration of the tests*

The auditory tests were so drawn up as to make each capable of administration within a single school period. In the case of the mixed school the knowledge test was separately administered under the supervision of the music teacher. In the other two cases, the papers for this test were distributed at the beginning of the period devoted to the taste test, and the children told that they could fill it up during pauses between records, or while the music was being played. It was considered that distraction of attention which might arise would be slight, and that in any case it would be quite a good thing to give the children something to do should their attention wander.[1]

It was hoped to administer the two tests with about a week between them, and to take each class separately. Exigencies of time, however, made it impossible to secure uniformity of test conditions, and the following arrangement had to be adopted:

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[1] It was noticed that the one class which did not do the knowledge test showed a marked openness to distraction during the period in question.

Boys' school: Classes taken separately; 12 days' interval.

Girls' school: All classes together; successive periods with 15 min. break between—an unsatisfactory arrangement.

Mixed school: All classes together; successive days.

In all cases the test of understanding preceded that of taste. How far the conditions affected the reliability of the results is of course uncertain; probably the effect was not very great.

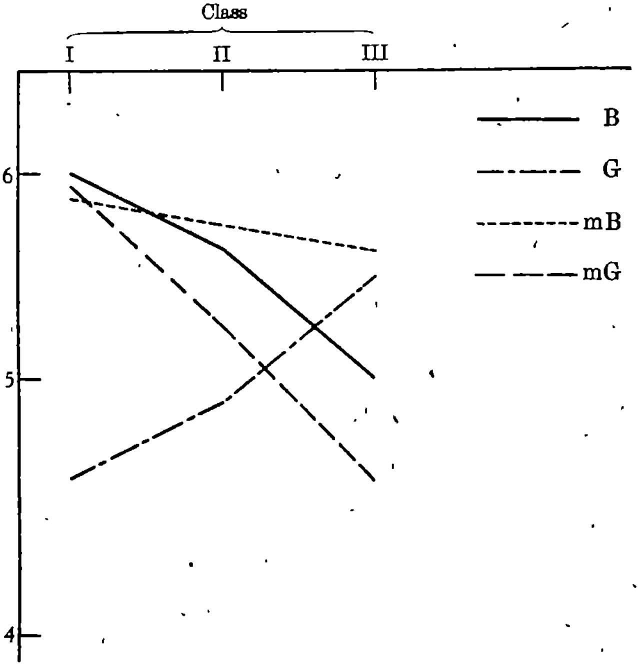

Fig. 1. Test of understanding. Means.

III. TEST RESULTS

It was originally hoped that scores on the tests used would vary directly with age, and that they might be at least comparatively independent of schooling. Nevertheless, the results were more easily classifiable, in the first instance, according to classes, and they were therefore treated accordingly. Means were calculated for each class separately, and these are shown in graphical form in Fig. 1 (Understanding) and Fig. 2 (Taste).

(1) *Test of understanding*

The results for the test of understanding are also shown in Table IV, together with mean scores on the same ten test items for two adult groups studied in the previous experiment. It will be seen that in three groups out of four there is a continuous and fairly regular drop in scores as one progresses from class I to class III. In the fourth group (the girls' school) the curve takes the opposite course. Redistributed into age groups the scores do not vary so regularly. This redistribution was carried out in two different ways: (*a*) according to *age last birthday*, and (*b*) to age *correct to one year*. The resulting curves are not included in the

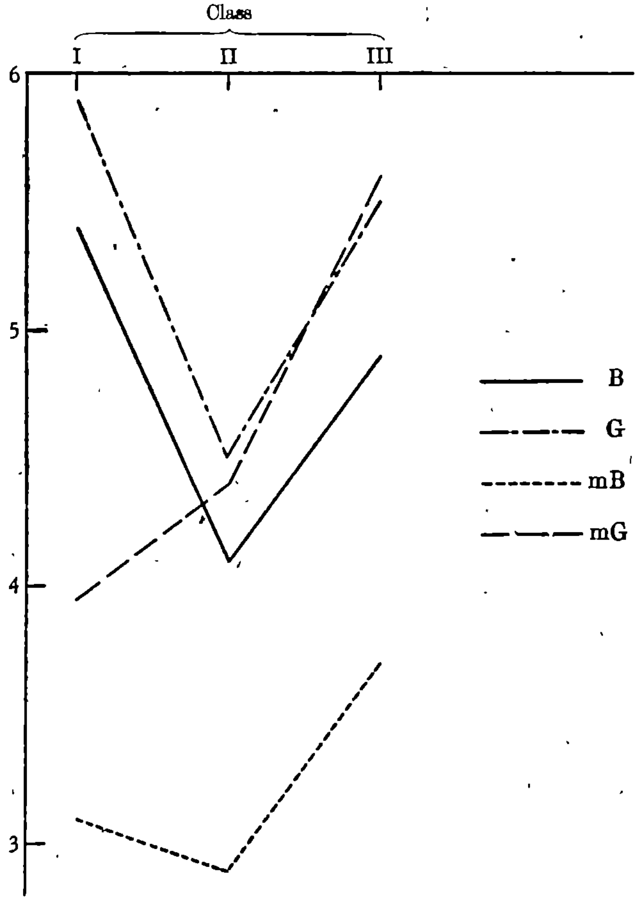

Fig. 2. Test of taste. Means.

Table IV. *Test of understanding: comparative scores of juvenile and adult groups*

Group	Class I	Class II	Class III	All
B	5·8	5·5	5·0	5·6
G	4·6	4·9	5·4	4·9
mB	5·7	5·6	5·5	5·6
mG	5·75	5·2	4·6	5·0
Unselected adults	—	—	—	5·6
Music students	—	—	—	7·1

present report, but it may be remarked that the curves for groups 'B', 'mB', and 'mG' still showed a decided tendency to fall with rising age, while that for group 'G' plotted according to method (*a*) rose much less steeply, and plotted according to method (*b*) showed an irregular up-and-down movement. The net result would seem to be that success in this test is less a function of age than of schooling. Nevertheless, correlations between test scores and age, shown in Table V, are interesting, and may be summed up by saying that on the whole there is a slight but definite tendency for musical understanding, as measured by this test, to deteriorate with age, although a certain degree of recovery occurs as adulthood is reached.[1]

Table V. *Test of understanding: correlations of scores with age*

Group	$r \pm$ P.E.$_r$	Remarks
B	$-0·28 \pm 0·066$	Significant
G	$+0·19 \pm 0·074$	Not significant
mB	$+0·04 \pm 0·093$	Approx. zero
mG	$-0·42 \pm 0·081$	Significant
All	$-0·17 \pm 0·040$	Significant

(2) *Test of taste*

Curves for the test of taste corresponding to those for that of understanding are shown in Fig. 2. As in the previous case, three of the four curves show the same general outline—in this instance *down*, between classes I and II, and then *up*, between classes II and III. The fourth curve also shows a rise in this second portion, but this is preceded by another less steep rise. Redistributing into age groups, as before, one finds the same general form preserved, more or less, for the three groups showing uniformity, and also, when method (*a*) was used, in the fourth group (mG). In view of these facts it is not surprising that the overall correlation between age and taste scores is practically zero (actually −0·017 ± 0·042). Taking the groups separately, none of the correlations is significant one way or the other. The important point, however, is that while from the age of 14 or thereabouts a gradual approximation to adult standards of taste takes place, a very definite fall occurs before that age is reached.

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[1] It should further be noted that partialling out 'knowledge' increases the negative correlation between understanding and age (see Table VI).

(3) *Test of musical knowledge*

It is not proposed to discuss in detail the results of the test of musical knowledge. Reference to Table VI will show a fairly low, but highly significant correlation with age. The scores obtained ranged from 12 to 33, with an overall average of 22·6. A fairly steady rise was found with progression through both classes and age groups, except that the youngest children tended to score slightly higher than their immediate seniors. This, however, is easily explicable in terms of the conditions of sampling; without this complication the correlation noted above might have been higher.

Table VI. *Correlations between all measures, juvenile and adult groups*

Measures correlated	$r \pm$ P.E.	Partial r	Adults $r \pm$ P.E.
AU	−0·17 ±0·040*	$r_{AU.K}$ −0·24*	—
AL	−0·12 ±0·042	—	—
AT	−0·017 ±0·042	—	—
AK	0·31 ±0·041*	—	—
UL	0·027 ±0·041	—	0·15 ±0·056
UT	−0·041 ±0·042	—	—
UK	0·16 ±0·045*	$r_{UK.A}$ 0·22*	0·39 ±0·052*
LT	0·17 ±0·042*	—	—
LK	0·001 ±0·046	—	0·02 ±0·059
TK	0·22 ±0·044*	$r_{TK.A}$ 0·24*	0·73 ±0·080*

A, age; U, understanding; L, 'liking'; T, taste; K, knowledge.

* Significant coefficients (coefficients not less than three times their probable errors).

(4) *Correlations between tests*

Table VI summarizes the correlation coefficients already mentioned, together with others it was thought desirable to compute. Reference to the writer's previous paper (4) will show that in the case of that experiment it seemed desirable to take into account a further measurable variable. This consisted of the number of selections in the test of understanding which the listener stated that he liked (irrespective of qualifications as to the degree of liking). The term 'liking' was used to express this number, and it was suggested that this represented a measurable quantity which was relatively constant for the individual. 'Liking' scores were therefore counted in the present instance as well, and correlations of these scores with the others are included in Table VI, together with any available comparable figures from the experiments with adult subjects.

The following main results, in addition to those already noted, emerge:

(1) Both understanding and taste show a positive correlation with knowledge, which, though low in each case, is nevertheless significant. Partialling out age, incidentally, increases the correlations to a slight extent.

(2) Correlations between understanding and taste and between liking and understanding are both practically zero. That between liking and taste, on the other hand, is positive, and of the same order as those discussed in the previous paragraph.

(3) The net result seems to be that understanding and taste are independent musical abilities. Whether 'liking' measures another aspect of musical talent is more open to doubt, since, unlike the other two measures, it has a zero correlation with knowledge, the only external criterion available within the limitations of the experiment. (The validity of knowledge scores as a criterion of musical ability is briefly discussed later.) If, however, its status could be established, it would appear that 'liking' would also have to be regarded as an aspect of musical ability more or less independent of the other two.

(5) *Sex differences*

A brief summary of sex differences observed in the test results is given in Table VII.

Table VII. *Sex differences in test results*

Test	Boys		Girls			
	Mean	No.	Mean	No.	Diff.	P.E. diff.
Understanding	5·51	141	5·01	123	0·50	±0·100
Taste	4·31	136	5·06	122	0·75	±0·192
Knowledge	23·2	98	22·1	89	1·1	±0·498

It will be seen that the boys show just about the same relative superiority over the girls in the test of understanding as the girls do over the boys in that of taste. This slight inferiority of the boys on the more purely aesthetic side confirms popular opinion regarding sex differences, as does their slight superiority in the informative knowledge test. (In calculating means for this latter the class I girls corresponding to the class I boys who did not take this test are omitted.). The differences in respect of understanding and taste are fully significant; that for knowledge, however, is only of the magnitude classed as 'suggestive'.

IV. DISCUSSION

(1) *Test of understanding: responses of children of different ages*

In the light of the high score obtained by young children in the understanding test, it is obvious that the applicability of the method is not confined to adults. How far down the age scale it would be possible to go, further adapting the material, is uncertain, but it is interesting to note that in the case of two items, no. 7 and, more particularly, no. 9, the percentage of correct answers recorded was higher in the juvenile than in the adult group. In only two instances, nos. 4 and 5, was the proportion of successes appreciably higher in the adult group. These, incidentally, are the two items from the *Carnival of Animals*, commonly described as specially suitable for children. In view of these findings it is of some interest to try to discover whether success in the individual items tended to increase with age. To this end, analyses into year groups were made in the same way as for the total test scores, with the results shown in Table VIII.

Table VIII. *Test of understanding: variation in understanding of individual items with age*

	Direction of curve with increasing age	
	Up	Down
Boys	6	2 3 5 10
Girls	—	5 8 10

It will be noticed that the downward tendency is much more common than the upward, and that it occurs not only in respect of rhythmic items (e.g. no. 5), but also in respect of music of a definitely adult character (no. 10).

Responses regarding 'liking' were also analysed, but without any result of outstanding interest. There were few marked differences between the respective proportions of children and adults who liked any individual item. The most marked divergences were in respect of no. 4, in which the percentage of adults was higher, and of no. 9, where the percentage was lower than that of either boys or girls in any single year group. Fairly steady drops in popularity were observed, for the boys in respect of nos. 1, 2, 4 and 5, and for the girls in respect of nos. 1 and 10. Regular variation in the contrary direction did not occur at all.

The net conclusion would seem to be that within the limits of the age groups studied, the material used showed no special unsuitability for children of any age, except the rather curious fact already hinted at, that music commonly considered specially suitable for children was neither more correctly interpreted nor more popular than the other selections used. It would seem to follow that at least in small doses children can appreciate much the same type of music as adults, and to the same degree.

(2) *Test of taste: validity of instructions and of general method*

Much more marked differences were found in the scores obtained by the juvenile and adult groups in the test of taste. In drawing up the test the writer had experienced some misgivings regarding the instructions, especially in relation to adult subjects. In his original application of the technique Mohler had used the terms 'best', 'next best', and 'poorest'. Since it was felt that at least with adult subjects the music judged 'best' might not necessarily be the same as that most enjoyed, the instructions were altered to the form in which they are quoted on p. 147 above. The writer had anticipated objection to the method on this score, but since no such objections were put forward, no questions as to whether such a thought had occurred were asked, in case an opportunity of further investigation of this point might arise. However, since the placings of the records by majority vote agreed with the assumptions regarding merit on the basis of which the selection was made, it seemed that the potential difficulty had not arisen—provided that strict adherence to instructions had been maintained on the part of the subjects, an assumption that it was fairly safe to make.

The serial order of the groups in the test was intended to present progressively finer degrees of difference in relative merit. It may be of interest to note that the results were contrary to what might have been expected: higher scores were obtained by the children on group III than on group II, and on group II than on group I. This may have been caused in part by the high rhythmic appeal of records IB and IIC, which were graded (3) in each case by the adults. This raises the point of the degree to which works in each group could be compared on terms as it were of equality. Since the records were chosen from the rather limited number which happened to be readily available, the selection was felt to be far from satisfactory. Nevertheless, it was found possible to include in each group works of approximately the same tempo and general emotional character.

(3) *Suitability of technique for the groups tested*

As regards the suitability of the actual testing technique, it is felt that a test period of 40 min. was not too long for children of the ages studied. On the other hand, the average playing time of a 12 in. or even a 10 in. record seems to be too long for sustained attention, especially in the case of the taste test, where a rather difficult attitude of combined expectancy and recall had to be maintained. Where possible, less than the whole of a single side was played, but the adoption of this expedient is undesirable in other ways, e.g. it may destroy the balance of a work such as a short classical overture. Shorter selections would allow of a larger number of groups for comparison in the same time, and this would make for both increased interest and increased reliability.

V. GENERAL CONCLUSIONS

In addition to the empirical results already discussed, the present experiment suggests the following general conclusions:

(1) The investigation yields no very definite evidence one way or the other regarding the possibility of establishing tests of untaught musical ability. The uniformity of the 'class' curves seems to indicate that a very considerable effect is produced by differences of schooling. On the other hand, the fact that variations with age did emerge, and that these included a marked falling-off in test scores in certain portions of the age range studied, suggests that under other circumstances one might be able to eliminate the effect of education to a greater extent. (This is borne out by the effects of partialling out certain variables, as already noted.) 'Other circumstances' which would repay study include groups of still younger children, and of persons who have had no training whatever in music or musical appreciation.

(2) The statistical treatment of the present data suggests that it is impossible to postulate the existence of unitary musical ability, except in so far as the talented musician would be regarded as one who possessed in a high degree all or most of a constellation of abilities, each of which had its significance in the performance, interpretation, or enjoyment of music. Accordingly, in music testing a 'profile' technique would seem to be indicated in preference to a pooling of results into a total score. A method such as this has been suggested by Schoen (2), who used his own battery of tests (3) as a basis for prognosis of the type of musical activity

for which a given individual was fitted. Such a 'profile' might also include results of tests of an active and for some purposes of a creative character (e.g. those of Vidor (6)), which fell outside the scope of the present investigation. It is hoped later to add to the present battery a test of the appreciation of form.

(3) The main difficulty in drawing up any such battery is that of determining the validity of any test as an indicator of musical ability or an aspect thereof. In the present instance, the only possible criteria were 'knowledge' scores and teachers' estimates. In his previous paper the writer argued that other things being equal persons musically gifted would show more interest in matters musical, and consequently achieve higher scores, but this is admitted to be at best a slender argument, especially when applied to the juvenile groups. Teachers maintain, with some degree of justice, that they are able, through personal contacts, to point to the gifted individuals in a particular group, but something more than this is necessary. An attempt was made by the writer to discover whether mean scores on all measures obtained by children who claimed to play an instrument were significantly higher than scores obtained by children who did not; the schools were taken both as a single unit and, since there was considerable inequality of opportunity, separately. No significant differences were found for separate schools, but taking all together every measure with the exception of understanding gave means for 'players' significantly higher than for 'non-players'. These differences were as follows: liking, 0·67 ± 0·166; taste, 0·70 ± 0·196; knowledge, 1·84 ± 0·387. (Understanding gave a margin of 0·17 in favour of the non-players.) A variety of difficulties, such as knowing how to deal with performers on the Jew's harp and Kazoo, and the heterogeneity of the sample already noted, make this criterion one of doubtful value in the present case, but the observed differences are highly suggestive. A combination of all three criteria might be used to give a sufficient indication of validity.

(4) While tests of the additional types mentioned in paragraph (2) above are of undoubted importance, it is felt that since at present the musical experience of the majority of people is limited to listening to music, attention should be paid to methods of testing which give the closest possible approximation to the normal experience of listening to music. Normal modes of listening vary considerably with circumstances, e.g. listening to a 'live' performance in a concert hall is a very different experience from listening to the gramophone or radio by oneself or in the company of a few friends, and the test situation in the present experiment

had its differences from and affinities with both. While the practice of having a large group of subjects listening simultaneously has its obvious advantages, the larger the group the more distractions, as in all group testing. Since, however, the method described takes up a good deal of time whatever the circumstances, it is felt that the risk of error may be accepted, and a group of moderate size be tested as a unit. Useful results from testing this variety of musical experience are possible not only from the point of view of the person tested, but also with regard to the light that they throw on the scope of the average listener's potential interpretative ability and aesthetic discrimination. It is hard to believe that the mediocrity of the musical entertainment commonly presented represents the limits of what the ordinary man or woman can be expected to appreciate.

(5) It is not suggested that fine differences of any aspect of musical talent are measurable by the method employed. Other investigators who may be interested to repeat the experiment might profitably make their own selection of records, and standardize within whatever degree of accuracy they think fit. In particular, new and improved series of test records could be made by a more complete exclusion of relatively familiar music, the use of which has its obvious disadvantages. Accordingly, the only claim put forward for the tests described is that they afford a means of detecting extremes of endowment in respect of certain qualities of a musical character. Whether there exists in addition a quality of 'musicality', testable by other means, remains to be seen.

VI. SUMMARY

The experiment described continues a line of enquiry reported in a previous paper, by extending a test of musical understanding there described to children between the ages of 12 and 15 inclusive, and by adding a test of musical taste, the standards for which were obtained from the majority vote of a small group of adults interested in music. In addition, a new test of musical knowledge was applied to the same children.

It was found that in general test scores did not increase with advance in age, but that, particularly in the test of understanding, the opposite took place. Scores on the two main tests were found to be uncorrelated, but each test correlated positively with knowledge. Significant sex differences were observed—boys having the advantage in the test of understanding, girls in that of taste. Significant differences on most measures were also found between children who played an instrument and those who did not.

The method and material both appeared to be as suitable for the juvenile groups studied as for adults. No conclusive evidence, however, was obtained regarding the extent to which the scores were affected by differences in education. Since there seems so far to be no reason to believe in the existence of a unitary musical ability, it is suggested that results of separate tests should not be pooled but presented in the form of a profile, possibly with others of a more active character. It is further suggested that while the technique employed is both valid and useful, other investigators who may care to repeat the experiment should be able to frame test series consisting of other records equally or more suitable for the purpose.

I should like to express my thanks to the headmasters and headmistress of the schools concerned for permission to carry out the testing programme, and my appreciation of the friendly co-operation received from the music teachers, from the children themselves, and in particular from the students and others who acted as voluntary subjects in the check experiment described in section II (2).

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DIP IN WORK CURVES

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I. INTRODUCTION

THE results here presented were obtained during a study of fatigue effects and their use as measures. The conventional measure of fatigue is that of loss in output over a given time, sometimes called the *decrement*. Another common suggestion is that tired work is more variable or erratic, whence the notion of a measure in terms of *increase in variability*, i.e. in the amplitude of the waves in the curve. The first problem of this present research was to see if there is a correlation between different forms of these measures (1).

When plotted on ordinary squared paper, a work curve is roughly hyperbolic. It has, therefore, been suggested that it should plot out approximately as a straight line on two-way log paper (2). If this is so, the simplest measure of decrement would be the downward angle or slope of that straight line. This is what we shall call the *angle of decrement*.

Matters were complicated during this research by the fact that the curve was still slightly curved, even when plotted on two-way log paper. A ruler laid on a typical curve, to join its first[1] and last points, may have all the rest of the curve below it in a slight 'bow'. The point of maximum departure lies somewhere between the 300th and 600th sec. in curves of a total length of 1200 sec. Here, the curve may in fact cease to fall, curving less and less until it is horizontal, or even rising slightly. We thus arrived at the need for a third measure, that of *dip or downward bulging* as distinct from those of *decrement* over the whole curve and of *increasing variability* respectively.

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[1] As will be noted in the text, the actual first point of a curve was always ignored, so that the effective first point here mentioned was really the second. It is a small matter, but is mentioned for the sake of complete accuracy.

II. PROCEDURE

Eighty students from training colleges acted as unpractised subjects for a Kraepelin adding test, adding two to each number along a row, working as quickly as possible, and beginning a fresh row every 5 sec. The output or work done by each subject was measured by the number of figures correctly computed each 5 sec. The subjects were composed of three groups, working for 1200, 1500 and 1800 sec. respectively, the outputs per 5 sec. for each subject were pooled for 25 sec., and the results plotted on two-way log paper, time being represented horizontally and output vertically.

It has been previously shown by Philpott (2) that "the curve of work has a general form roughly approximating to a rectangular hyperbola, and that, if the logs of time and output are plotted, the work curve should tend to appear as a straight line, the fatigue decrement thus being measurable in terms of a single linear expression".

The rectangular hyperbola can be expressed by the equation,

$$xy = k \text{ (a constant)},^1$$

and taking logarithms,

$$\log x + \log y = k' \text{ (a constant)}.$$

Hence if log y be plotted against log x a straight line will result and it will have a negative gradient of unity.

If the curve is a perfect rectangular hyperbola, by plotting log output against log time it will be translated into the straight line form. Actually, of course, this is not so, but if the curve of output does fairly approximate in shape to such a hyperbola, the plotting of the logs of time and output should effect a considerable flattening.

We found that work curves of individual subjects so plotted were considerably flattened and smoothed, and that the grand total curves were approximately straight lines within certain limitations.

In finding a measure of decrement the first point on each curve was omitted. The reason for this is as follows:

Let it be supposed that output is constant in log time, i.e. that the subject does 'p' units of work in every successive time interval. The

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[1] So far as is known to the writer, Birtwistle (3) was the first to use this new technique.

resulting curve of output will be a horizontal straight line in log time. If the line is now expressed as output per second in ordinary time, it will take on a hyperbolic appearance, although it will not be a true hyperbola as it stands, being amounts per finite instead of infinitesimal time units, and further it will not be asymptotic about the axes of time and output.

Now let this second variant be re-expressed as a curve on two-way log paper. It will be almost a straight line, save for the first point, and to a very slight extent, the second point. But it will no longer be horizontal; it will be inclined to the base line, as has been previously shown.

Our measure of decrement was the line of 'best fit' to the remaining portion of the work of each subject. This was calculated by finding a regression line. Using Yule's notation for regression lines (6), the line suitable for the purpose is

$$y=b_2x, \text{ where } b_2=r.\frac{\sigma_y}{\sigma_x},$$

and for a work curve x will be a time measure and y an output ordinate. Further, b_2 is the tangent of the angle of inclination of the line of 'best fit' and could serve as a satisfactory measure of decrement.

In practice, twenty-one equidistant points are marked on the time line, each 1 cm. apart. From each point an ordinate, measured in millimetres, is drawn to the curve; the mean of these ordinates is calculated. The x values are calculated as arbitrary units, -10 to $+10$, and the y values are deviations with respect to sign from their mean (actually in millimetres). Thus the regression line is of the form

$$y=\frac{\Sigma xy}{10\Sigma x^2}.x \quad \text{and} \quad b_2=\frac{\Sigma xy}{10\Sigma x^2}$$

and will have a negative value.

A separate work curve was plotted for each subject, and a regression line evaluated from each curve.

III. Results

(a) *Appearance of work curves*

Studying the individual work curves, in each case there appeared a dip or concavity (see Fig. 1). The region of the dip in every curve was from 400 to 800 sec. approximately, this dip being more marked in some cases than others. After 900 sec. the curves rose steadily in nearly every case.

It is seen in Fig. 2 that our grand total curves fitted the hyperbolic theory extraordinarily well for the first 400 sec. From this point there was an abrupt change. The slope vanished and the curve was practically horizontal, and from 600 sec. the curve gradually ascended for the remainder of the time. The part after 600 sec. appeared much more erratic than the downward slope for the first 400 sec., owing partly to the crowding of points.

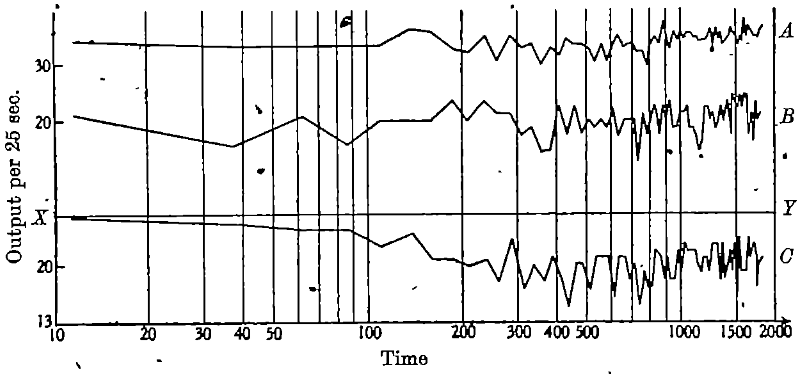

Fig. 1.

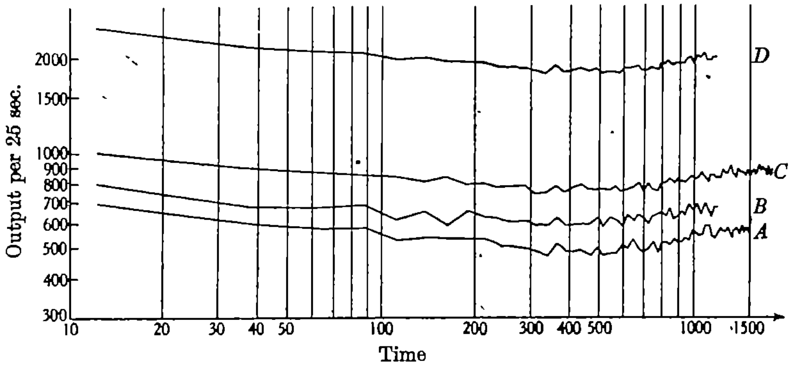

Fig. 2.

Thus our line of 'best fit' only fits well for the first 400 sec. or the first 600 sec. at most. The decrement thereafter tends to be lessened by the rise in the curve, the longer the curve the greater the lessening. In fact, the output is almost as great at the end of the curve as it is at the beginning. If we measured fatigue by the old method of determining the difference between initial output and final output, very little fatigue would be shown.

The effect of the dip and the following rise in the curve can be made manifest by inquiring what kind of measures we should have obtained had the subjects stopped work earlier. Our experiments actually lasted 1200 sec. What measures of decrements, etc., would there have been had they lasted only for say 100 or 200 sec., etc.?

For purposes of this inquiry, the curves were plotted against the log of time. The base line was then arbitrarily cut into twenty-one equal spaces (logarithmically speaking). Regression lines were then calculated over the first nine intervals, over the first eleven, the first thirteen, and so on. We thus obtained the measures of decrement that would presumably have been obtained had the original experiment been cut to one or other of the given lengths.

The figures are given in Table I against the (arbitrary) log lengths concerned together with the corresponding lengths in seconds.

Table I

Arbitrary log measure	Corresponding number of sec.	Tangent of angle of decrement
9	195	−0·0650
11	285	−0·0727
13	410	−0·0780
15	590	−0·0711
17	855	−0·0566
19	1200	−0·0388

From this table we observe that decrement is fairly constant for as far as 600 sec., i.e. to the extent of the dip. After this, the rise in the curve affects this value by compensating for the dip, i.e. lessening the value of the decrement. It is noticed that the value of decrement for the first 400 sec. is twice that of the 1200 sec. If we calculated for 1800 sec. the value would probably be still lower owing to the upward trend of the curve.

In stating our problem we stated that decrement was one of our measures of fatigue. Hence, from the above table, we see that to some extent it is unreliable. The measure is fairly constant so long as the curve has a downward slope, i.e. for 600 sec. Thus the actual value which we attach to decrement depends upon the length of the curve.

(*b*) *Measurement of dip*

At this point we can attempt a measure of dip. There are two main angles, that over the whole curve already measured (covering say 1200 sec.), and the angle over the first portion of curve, say up to 600 sec.

In nearly every case, the slope of the 600 sec. line was greater than that of the other, and by an amount that can be given as $b_2 - c_2$, where b_2 and c_2 are the tangents of the two angles concerned; or of course, it can be expressed in degrees and minutes, this giving the angle of dip. The angle of dip is then a difference. It is the amount by which the slope varies when we calculate it over 600 and 1200 sec. Other measures would have been possible. This one will suffice. It at any rate gives some measure of the thing desired to be measured, namely departure from simple linearity. It is conceivable that this departure would occur more readily in cases of extreme fatigue. That is to say, there may perhaps be a correlation between dip and the decrement (i.e. the 1200 sec. angle). The obtained value was $+0{\cdot}26$. There is then some degree of relation.

By the method of calculating the regression line for decrement, more weight is given to the extreme points, i.e. beginning and end of the curve. Thus large values at the end of the curve could make our value decrement seem small. Conversely, when calculating the regression line for the first 600 sec. only, more weight is given to the end of that particular curve, i.e. to the low value of the dip region. This will give the regression line for the first 600 sec. a large decrement, and possibly a correspondingly large value for the angle of dip. This accounts for the only moderate value for the correlation coefficient.

(c) *To find a measure of increase in amplitude*

Several difficulties had to be overcome in obtaining this measure. We here give an outline of them.

Amplitude represents the difference in output from a crest to the next succeeding trough—or *vice versa*—in a work curve. As there are so many differences in a curve of 1200 sec., we must find a method which takes into account all of them, at the same time not giving undue weight to a particular section of the curve. Flugel's curve of successive differences (4) does show this, but we set out to find another measure.

Our first attempt was found to be untrustworthy. If we take the measure of decrement for the 1200 sec. utilized above, the regression line is really a line of ideal output throughout the length of the test. This we can utilize, plotting each point of a work curve as a deviation, regardless of sign, positive or negative, from the amount of ideal output at that point.

Taking the deviations for the vertical axis, and the time as the horizontal axis, we can plot on ordinary graph paper a graph for each subject.

Similarly, utilizing the method outlined for calculating a regression line, we can obtain a line of 'best fit' for the subject's deviations. The slope of this line, with regard to sign, could be taken as a measure of increase in amplitude.

Our line of 'best fit' which we have taken for decrement although affected by the dip factor and the upward trend from 900 sec. onwards, cannot wholly take these factors into account. Thus our deviations in the centre of the 400–800 region will have too much weight, whilst at the 800 region they will have too little weight, and for the regions afterwards they will tend to have undue weight. From these findings it will be seen that the deviations will tend to give an undue or incorrect increase in amplitude, especially as the rise after 900 sec. gives added weight to the regression line.

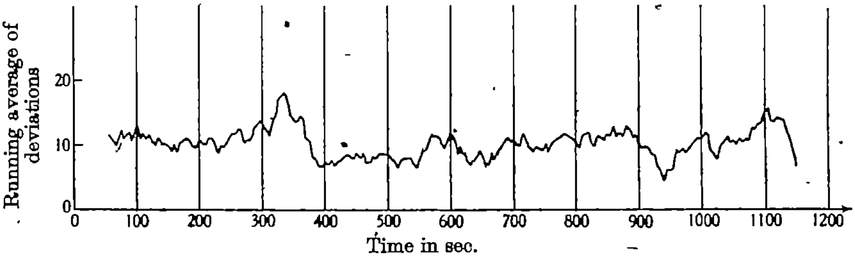

Fig. 3.

In our second attempt we utilized a curve of running average. "To get the curve of running average, take the average of points 1 to 11 in the original curve, then the averages of points 2–12, 3–13, and so on. These successive averages plotted against the centres of the intervals concerned give the desired curve" ((5), p. 112). Every point in the original curve was now expressed as a deviation from the running average, plotting without regard to sign. From this graph of deviations, the regression line was found in the usual way. The slope of the line was our measure of increase in amplitude.

As a curve of 1200 sec. would have nearly 240 points, we marked each fifth point on the time or x axis, and used an arbitrary time scale from -23 to $+23$ (i.e. 47 points). We measured the y values for these particular points. Actually in plotting these curves we plotted the deviation between the total running averages (i.e. not divided by eleven) and eleven times the output for the said point. We further produced a grand total curve of deviations from running average. We smoothed this curve by taking the running average of it (see Fig. 3). We found there is a rise in the curve as far as 330 sec., but this is followed by a very sudden fall, corresponding to the beginning of the dip region. During the dip region, from 400 to 550 sec., the curve is more or less horizontal. On leaving the dip region, i.e. from 550 sec. onwards, the curve shows an upward trend although this is not constant, taking place by a series of rises and falls. It is noticed that this rise is gradual compared to the abrupt fall from 330 to 400 sec.

In our investigations, we considered Flugel's measure of increase in amplitude, i.e. successive differences. His measure appears to be wholly satisfactory for his experiment. His subjects became much more practised as the experiment proceeded daily, and hence no dip region was noticed in his work curve. Utilizing his measure for our own experiment would not eliminate the dip factor, in fact it would accentuate it, making the correlation untrustworthy in the same way that we found to occur with our first measure, i.e. measuring deviations from the line of 'best fit'.

(*d*) *Correlation between dip and increase in amplitude*

In the research we correlated increase in amplitude with the measure for decrement for the whole 1200 sec.; our result was $-0{\cdot}14$. To show the effect of dip in our curves we correlated the measure for decrement for the first 600 sec. with the measure for increase in amplitude for the whole 1200 sec., the correlation being $-0{\cdot}075$, showing there is little relation between these two measures. Further, we set out to ascertain whether there was any correlation between angle of dip and increase in amplitude. We again only obtained a low value of $-0{\cdot}042$.

(*e*) *Amplitude and trough sequences in the dip region*

Concerning the dip region we find two interesting points. The deviations are only more noticeable at the beginning and end of the region. During the period of low output the deviations are almost constant, and in fact they are practically the lowest for the whole curve.

Thus it seems that increase in amplitude is most marked when the depression or conflict, as mentioned in the subjects' introspections, is taking place or asserting itself. When the subject's depression has manifested itself, his output is low, but the amplitude is correspondingly low. When his output increases, i.e. after about 600 sec., amplitude increases with it.

Philpott (2) has shown that work curves have zones *A* and *B*, and that the wave-length in zone *A* may differ from that in zone *B*, and also that the L.C.M. sequences are of a composite nature. The curves have many L.C.M. cycles, so many in fact that those characteristic of zone *A* can summate to accentuate the troughs of that zone, cycles of zone *B* pattern summating in their turn, the resulting curve thus seeming to change in wave-length as we pass from one end to the other. This at least usually occurs, though not always.

For a grand total curve he has shown that troughs should occur approximately at 49, 63½, 80, 103, 130 ... sec. Considering our own grand total curve we find that troughs occur at 63½, 80, 103, 130 ... sec.

Studying work curves we find that amplitudes are small to begin with, afterwards opening out, but then there comes a period of small oscillations followed by the amplitudes sweeping out. This period of small oscillations corresponds to our dip region. Philpott has shown that this period of small oscillations is the period of change from zone *A* to zone *B*. This change is quite noticeable in our grand total curve. It may perhaps be considered due to the beat effect of L.C.M. cycles.

IV. SUMMARY

Dip or downward bulging has occurred in all our work curves, being confined to a particular region of the curves, from 350 to 600 sec. We have measured it by determining the difference in the angle of slope of the two regression lines: those taken between 0 and 1200 sec., and from 0 to 600 sec. respectively.

There is a small positive correlation between the angle of dip and the angle of decrement, showing that if angle of decrement was large, output in the first 600 sec. might have decreased very rapidly.

On the other hand, dip seems to have little connexion with increase in amplitude over the full 1200 sec., nor does the regression line for the first 600 sec. correlate to any extent with increase in amplitude. So that rapid drop in initial output does not necessarily show that output in the latter part of the test will be erratic.

Amplitudes of the waves of the curve were found to be small in the dip region (from 350 to 600 sec.), but were large just before and after it. Again, dip takes place in the region where zone *A* is merging into zone *B*; further, because the dip occurs in this region, amplitudes are small.

Also the beginning of the dip region is marked by the manifesting of feelings of conflict; on this dying down, the rate of output increases, and increase in amplitude is also observed.

It may be that the conflict is due to change in the zones and to the smallness of the amplitudes, or, the other way round, the switch from zone A to zone B may be due to the conflict. This problem has not been solved by the enquiry.

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A BI-FACTOR ANALYSIS OF RELIABILITY COEFFICIENTS

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I. *Holzinger's bi-factor method* (pp. 172–173).
II. *A bi-factor analysis of the intercorrelations between the halves of three equivalent test forms* (pp. 173–175).
III. *Interpretation of factors* (pp. 176–177).
IV. *A comparison of multiple orthogonal factors with bi-factors* (pp. 177–180).
V. *Some observations regarding the comparison in section IV* (pp. 180–181).
VI. *Summary* (pp. 181–182).
References (p. 182).

I. Holzinger's bi-factor method

Holzinger's method of bi-factor analysis (1) attempts to describe a matrix of correlations in terms of one general factor, a number of group factors common to two or more variables, and as many specific factors as there are variables. This reduces the matrix to a minimum factorial description of one general factor, n specific factors, where n is the number of tests, and q group factors, q being smaller than n. The procedure is to examine the matrix of correlations to be factorized in order to isolate any groups of tests that correlate more highly among themselves than they do with the remaining tests in the battery, grouping those tests together whose intercorrelations constitute elements in vanishing tetrads.

In allocating tests to groups Holzinger uses what is termed a B-coefficient. A B-coefficient is defined as, "the average of all intercorrelations of tests 1, 2, ..., K, divided by the average of all correlations of tests 1, 2, ..., K, with the remaining tests not in the group" (2).

Having allocated the tests to groups, the next procedure is to remove the general factor. This is accomplished in a manner similar to that employed by Spearman in estimating g loadings by averaging all possible combinations of

$$r_{ig}^2 = \frac{r_{ij}r_{ik}}{r_{jk}}. \tag{1}$$

In the bi-factor method, however, only those values of r are used that are elements in tetrads approximating zero.

Let the following represent a hypothetical bi-factor pattern with six variables:

	A	B	C	D
1	a_1	b_1	.	.
2	a_2	b_2	.	.
3	a_3	.	c_3	.
4	a_4	.	c_4	.
5	a_5	.	.	d_5
6	a_6	.	.	d_6

Examination of this factor pattern will show that certain tetrads such as $r_{13}r_{24}-r_{14}r_{23}$ will be zero, while certain others such as $r_{12}r_{34}-r_{14}r_{23}$ will be greater than zero. In the above factor pattern there will be four values of r_{1a}, which with fallible data must be averaged. Thus the formula for the general factor loading of the first variable becomes,

$$r_{1a}{}^2=\frac{r_{13}r_{15}+r_{14}r_{16}+r_{13}r_{16}+r_{14}r_{15}}{r_{35}+r_{46}+r_{36}+r_{45}}, \tag{2}$$

The general factor having been removed, a table of residual correlations is calculated, and the group factors removed successively.

II. A BI-FACTOR ANALYSIS OF THE INTERCORRELATIONS BETWEEN THE HALVES OF THREE EQUIVALENT TEST FORMS

In the present enquiry three Moray House Group Tests of Intelligence M.H.T. 21, M.H.T. 23, and M.H.T. 26, were given to a sample of 212 children of 11+ in West Yorkshire schools.

Each test contained 100 items and required 45 min. to administer. One week elapsed between the administration of each test. The three tests are similar in structure and are regarded as parallel forms. The scores of each child on the odd and even items of each test were found. The fifteen different intercorrelations between the six halves of the three tests were calculated. Three of these intercorrelations are between halves of tests given on the same day, the correlation between the odd and even items of the same tests, while twelve are the intercorrelations between halves of tests given on different days. Since the three tests are regarded as parallel forms each correlation may be regarded as a reliability coefficient of a half test. None of the coefficients has been 'boosted' by the Spearman-Brown formula. Evidence will be advanced later in this paper to show that the three forms used exhibited a high degree of equivalence.

Examination of the matrix of intercorrelations (Table I) between the split-halves of the three parallel forms of the same test shows immediately without the application of Holzinger's B-coefficient technique that the correlations between the odd and even items of the same tests are higher than the correlation between the odd or even items of different tests, or between the halves of the tests given on different days.

Table I

	1	2	3	4	5	6
1	—	0·9457	0·9086	0·8937	0·8643	0·8932
2	0·9457	—	0·9081	0·8953	0·8609	0·8969
3	0·9086	0·9081	—	0·9393	0·8806	0·8993
4	0·8937	0·8953	0·9393	—	0·8527	0·8764
5	0·8643	0·8609	0·8806	0·8527	—	0·9278
6	0·8932	0·8969	0·8993	0·8764	0·9278	—

The correlations between halves of the same test have been marked off in Table I by diagonal blocks, and they form non-vanishing tetrads with the other coefficients in the matrix. The correlations between halves of the tests given on different days form tetrad equations whose values do not differ significantly from zero. It is evident, therefore, that it is possible to analyse the present matrix of correlations into a minimum number of one general factor, and three group factors. Since the coefficients in Table I represent the correlations between parallel forms of the same test no specific factor is to be expected. If the tests used had not approximated to a high degree of equivalence, specific factors would have required consideration. The close correspondence of the intercorrelations of the halves of the tests is suggestive that adequate parallelism was secured.

In the present analysis the first factor loadings were estimated by formula (2), and are recorded in the first column of the factor pattern, Table III. The residuals $\underline{r}_{ij} = r_{ij} - a_i a_j$ were then calculated. The table of residuals after removal of the general factor is given in Table II.

Table II. *First residual correlations*

	1	2	3	4	5	6
1	—	0·0426	−0·0026	0·0024	−0·0010	0·0012
2	0·0426	—	0·0050	0·0036	−0·0047	0·0045
3	−0·0026	0·0050	—	0·0396	0·0071	−0·0012
4	0·0024	0·0036	0·0396	—	−0·0016	0·0044
5	−0·0010	−0·0047	0·0071	−0·0016	—	0·0727
6	0·0012	0·0045	−0·0012	0·0044	0·0727	—

Examination of the first residual matrix indicates that the general factor loadings have described with a high degree of accuracy the majority of the intercorrelations. The residuals $\underline{r_{12}}$, $\underline{r_{34}}$, $\underline{r_{56}}$ are, however, considerably larger than the remaining residuals, and indicate the expected tendency of further overlap between variables 1 and 2, 3 and 4, 5 and 6.

The next step in the calculations was to find the error variance of each variable by the formula $e_i^2 = 1 - r_{ii}$, where e_i^2 is the error variance of variable i and r_{ii} is the reliability coefficient of variable i. The loadings of the error factors were thus found, and these are recorded in the staggered e_i column of Table III. In estimating these loadings the odd-even item correlation of each test was taken as r_{ii}, and the assumption made that the odd items of each test had an error variance equal to that of the even items. This is, indeed, a justifiable assumption, and the only one that can be made in the present analysis.

The remaining group factors were then readily calculated by the following simple formula,

$$r_{ib}^2 = 1 - r_{ia}^2 - e_i^2,$$

where r_{ib}^2 is the variance of factor b in test i, r_{ia}^2 the variance of the general factor, and e_i^2 the error factor variance of test i.

Table III. *Factor pattern*

Variable	Factor I *a*	Factor II *b*	Factor III *c*	Factor IV *d*	Error factor loadings e_i						h^2
1	0·9501	0·2074	—	—	0·2330						0·9457
2	0·9505	0·2054	—	—		0·2330					0·9457
3	0·9591	—	0·1393	—			0·2464				0·9393
4	0·9381	—	0·2435	—				0·2464			0·9393
5	0·9107	—	—	0·3137					0·2687		0·9278
6	0·9389	—	—	0·2152						0·2687	0·9278

The factor pattern of Table III describes with considerable accuracy the original correlation matrix. Some estimation of how closely the final factor pattern accounts for the original correlations is given by examination of the final residuals in Table IV.

Table IV. *Final residual correlations*

	1	2	3	4	5	6
1	—	0·0000	−0·0026	0·0024	−0·0010	0·0012
2	0·0000	—	0·0050	0·0036	−0·0047	0·0045
3	−0·0026	0·0050	—	0·0057	0·0071	−0·0012
4	0·0024	0·0036	0·0057	—	−0·0016	0·0044
5	−0·0010	−0·0047	0·0071	−0·0016	—	0·0052
6	0·0012	0·0045	−0·0012	0·0044	0·0052	—

III. INTERPRETATION OF FACTORS

The factors isolated by the above analysis require interpretation. Close correspondence of the general factor loadings, and also of the group factor loadings, is a good criterion of test form equivalence. Variable 5 (the odd items of M.H.T. 21) manifests the highest degree of inequivalence, but this inequivalence is not sufficiently prominent to introduce a specific factor loading approximating anywhere near significance. The close correspondence of factor loadings as calculated above is a better index of test equivalence than the correspondence of the intercorrelations between split-halves. If the halves of the various tests used are equivalent then the intercorrelations of the halves of the tests given on different days should be equal within the limits of sampling error. The converse, however, does not hold. The fact that the correlations between the halves of tests given on different days are equal is no indication of test equivalence. If A were a test of intelligence and B a test of ability to do arithmetic, and a_1, a_2 are the odd and even items respectively of test A, while b_1, b_2 are the odd and even items respectively of test B, then $r_{a_1b_1}$, $r_{a_1b_2}$ $r_{a_2b_1}$, and $r_{a_2b_2}$ could readily be equal, and yet it is obvious that A is a test of different structure from B. What is indicated, however, is that the odd and even items on test A are equivalent, and the odd and even items on test B are equivalent, but the halves of A are not equivalent to the halves of B. Close correspondence of the factor loadings of two forms of a test, when used in the same battery of tests, both parallel forms being applied to the same group of children, is a reliable index of the equivalence of the two forms. In the above analysis the absence of anything approaching a significant specific is demonstrative that good equivalence has been obtained.

The group factors isolated by the above analysis may be termed factors of temporal contiguity, a term first used by Thouless (3). If we could conclude that the function measured were a non-fluctuating one, then these group factors could be interpreted as largely the result of error correlation. If we could conclude that in correlating the split-halves of the same test the errors were uncorrelated, then the group factors could be described as manifestations of the absence of functional variability between those tests having group factors in common. Since, however, it is not unlikely that both the correlation of errors and functional variability are exerting a positive influence on the size of the group factors, and since no method of determining the relative importance of these two influences is at the moment apparent, it is only possible to describe these factors as factors of temporal contiguity, and to regard them merely as the resultant of those influences that tend to reduce the correspondence between test scores on parallel forms of the same test with increase in the time interval between their applications.

IV. A COMPARISON OF MULTIPLE ORTHOGONAL FACTORS WITH BI-FACTORS

To obtain a comparison between the factors obtained by the above bi-factor analysis, and those obtained by multiple factor analysis (4) the intercorrelations given in Table I between the split-halves of three parallel forms of the same test were analysed by Thurstone's method (5). The largest correlation in each row was used as the diagonal element, and was maintained unchanged throughout the analysis in that it represented a very close approximation to the true communality. It was found that this matrix of correlations could be adequately described in terms of three multiple orthogonal factors instead of four bi-factors. This is in complete correspondence with the findings of Holzinger that four bi-factors can be described in terms of three multiple orthogonal factors. The centroid solution of the Thurstone analysis is given in Table IA.

Table IA

Tests	Loadings of the factors centroid solution I	II	III	Communality h_i^2
1	0·9560	−0·1044	0·1401	0·9445
2	0·9563	−0·1049	0·1498	0·9480
3	0·9602	−0·0690	−0·1217	0·9416
4	0·9465	−0·1297	−0·1687	0·9411
5	0·9320	0·2472	−0·0166	0·9300
6	0·9508	0·1604	0·0111	0·9299

The communalities of the centroid solution are in close agreement with the communalities of the bi-factor solution, and both patterns describe the correlations of the original matrix with a close degree of accuracy.

The factor pattern of Table IA was now rotated to remove negative loadings, and to obtain as many zero loadings as possible, while still maintaining a factor space of three dimensions. This was done by rotating two factors at a time graphically, factors I and II being rotated first, and then factors I and III. Each pair of columns of loadings was post-multiplied by a 2 × 2 orthogonal matrix representing a rotation of rectangular axes in two dimensions through a given angle θ. The elements of this orthogonal matrix

$$\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$$

were found by regarding the loadings of the test through which the axes were rotated as co-ordinates of a point in a plane, and by these co-ordinates calculating the sine and cosine of the angle of rotation. The rotated factor loadings are given in Table IIA.

Table IIA

Tests	Rotated factor loadings I	II	III	Communality h_i^2
1	0·9229	*0·0004*	0·3052	0·9449
2	0·9216	−*0·0001*	0·3149	0·9485
3	0·9687	*0·0360*	*0·0475*	0·9419
4	0·9700	−*0·0258*	*0·0000*	0·9416
5	0·8881	0·3474	0·1451	0·9304
6	0·9119	0·2631	0·1723	0·9305

The factor pattern of Table IIA is one of a large number that could be obtained by using different angles of rotation. Four of the loadings of factor II, and two of the loadings of factor III are regarded as zero. These loadings are italicized in Table IIA. All other loadings are positive. No system of rotation can produce more than six zeros in this pattern in this three-dimensional factor space. The bi-factor solution describes the observed correlations in terms of four factors and twelve factor loadings. The rotated multiple factor pattern describes the same correlations in terms of three factors and twelve factor loadings.

By the method described by Holzinger in *Student Manual of Factor Analysis* (1) the relationship between the two factor patterns can be found, the relationship being expressed in terms of a set of three linear equations. This involves the reduction of the original tests to as many new variables as there are group factors in the bi-factor solution. In this case the six original tests are expressed in terms of three composite tests z_a, z_b, z_c. The first factor loading of the composite test z_a for both bi-factor and multiple orthogonal patterns is found by adding the first factor loadings of tests 1 and 2, and dividing this sum by the combined standard deviation of these tests. The formula for the combined standard deviation as given by Holzinger for n variables is

$$\sigma_{1+2+3\,\ldots\,n} = \sqrt{\{n + 2\,(r_{12} + r_{13} + r_{14} \ldots r_{(n-1),n})\}}.$$

The values in the present case are $\sigma_{1+2} = 1{\cdot}9729$, $\sigma_{3+4} = 1{\cdot}9694$, and $\sigma_{5+6} = 1{\cdot}9635$.

The reduced factor pattern calculated from the bi-factor solution is found to be as follows:

$$\begin{array}{llll} & & & h_i^2 \\ z_a = 0{\cdot}9635a + 0{\cdot}2093b & & & 0{\cdot}9721 \\ z_b = 0{\cdot}9633a & + 0{\cdot}1944c & & 0{\cdot}9657 \\ z_c = 0{\cdot}9420a & & + 0{\cdot}2694d & 0{\cdot}9599 \end{array}$$

Taking the same composite tests for the multiple factor solution, we obtain the following set of equations:

$$\begin{array}{ll} & h_i^2 \\ z_a = 0{\cdot}9350Z_1 + 0{\cdot}0001Z_2 + 0{\cdot}3143Z_3 & 0{\cdot}9730 \\ z_b = 0{\cdot}9844Z_1 + 0{\cdot}0052Z_2 + 0{\cdot}0241Z_3 & 0{\cdot}9697 \\ z_c = 0{\cdot}9167Z_1 + 0{\cdot}3109Z_2 + 0{\cdot}1617Z_3 & 0{\cdot}9631 \end{array}$$

The communalities in both sets of equations are in close correspondence. The intercorrelations of the reduced tests are given in Table IIIA.

Table IIIA

	Multiple			Bi-factor	
	z_a	z_b		z_a	z_b
z_a	—	—	z_a	—	—
z_b	0·9280	—	z_b	0·9281	—
z_c	0·9080	0·9079	z_c	0·9076	0·9074

The two sets of correlations given in Table IIIA are in close agreement and indicate that both patterns are equally good fits of the observed correlations.

By equating these two sets of equations, and solving for Z_1, Z_2, and Z_3, we can attain a set of equations which show the relationship between the two sets of factors by describing the multiple factors in terms of bi-factors. These three equations are found to be

$$Z_1 = 0{\cdot}9741a + 0{\cdot}1059b + 0{\cdot}2144c - 0{\cdot}0043d,$$

$$Z_2 = 0{\cdot}0712a - 0{\cdot}3291b - 0{\cdot}3057c + 0{\cdot}8880d,$$

$$Z_3 = 0{\cdot}1654a + 0{\cdot}7226b - 0{\cdot}6285c - 0{\cdot}0153d.$$

The standard deviations of Z_1, Z_2, and Z_3 in the above equations approximate to unity, and the intercorrelations of the Z's approximate to zero.

The relative importance to be attached to each bi-factor in describing the Z's may be found by squaring all the values in the above equations obtaining the following:

$$\sigma z_1^2 = 0{\cdot}9489\ \sigma_a^2 + 0{\cdot}0112\ \sigma_b^2 + 0{\cdot}0460\ \sigma_c^2 + 0{\cdot}0000\ \sigma_d^2,$$

$$\sigma z_2^2 = 0{\cdot}0051\ \sigma_a^2 + 0{\cdot}1083\ \sigma_b^2 + 0{\cdot}0935\ \sigma_c^2 + 0{\cdot}7885\ \sigma_d^2,$$

$$\sigma z_3^2 = 0{\cdot}0274\ \sigma_a^2 + 0{\cdot}5222\ \sigma_b^2 + 0{\cdot}3950\ \sigma_c^2 + 0{\cdot}0002\ \sigma_d^2.$$

From these equations it is apparent that nearly all the variance of Z_1 is attributable to the bi-factor a. Z_2 is made up largely of the bi-factor d, while Z_3 is composed largely of the bi-factors b and c.

V. SOME OBSERVATIONS REGARDING THE COMPARISON IN SECTION IV

The above enquiry commenced with the initial hypothesis that factors of temporal contiguity existed, tending to make the intercorrelations between tests given on the same day greater than the intercorrelation between the same tests given on different days. The necessary intercorrelations were calculated, and the postulated factors of temporal contiguity isolated and measured by a bi-factor analysis. It was found that the bi-factor solution furnished a factorial configuration in complete agreement with the postulated psychological hypothesis. The compatibility between the factorial configuration and the psychological hypothesis was sufficient to regard the initial hypothesis as proved.

When we now come to analyse our table of intercorrelations by multiple factor methods we find that an equally accurate mathematical description can be obtained in terms of a pattern of three factors, but no matter what method of rotation is adopted these three factors can never be transformed into a psychologically meaningful configuration within a factor space of three dimensions, a factor space of four dimensions being required before our factor pattern can become compatible with our initial hypothesis. It is of course clear that an orthogonal transformation can in theory be attained capable of rotating the three multiple factors into a psychologically meaningful four factor space. This would involve postmultiplying the factorial matrix of order 6 × 3 with known elements by an orthogonal matrix of order 3 × 4 of unknown elements. The estimation of the elements of the orthogonal matrix capable of bringing the multiple factor pattern into agreement with the bi-factor pattern is a matter of considerable mathematical difficulty, and of great arithmetical labour.

In the present example the simplicity of our factor pattern renders the inadequacy of a three dimensional factor space, and the necessity of an additional space, readily observable. Furthermore the difficulty of attaining a meaningful interpretation of our three rotated multiple factors is also apparent. With more complicated factor patterns, however, this difficulty is not readily observed, and the psychologist has no clue to direct him to the conclusion that his factor pattern must be rotated into additional dimensions to obtain meaningful factors. The assumption is usually made that a minimum number of factors with as many zero loadings as possible is likely to be the most meaningful configuration attainable. In our present example such a configuration has little if any meaning, and it does not seem likely that in more complicated patterns the reduction of the number of factors to a minimum would necessarily lead to the most meaningful solution. Our conclusion is, therefore, that under certain circumstances by reducing the number of factors to a minimum we shall arrive at an invalid interpretation of the mental factors involved in the performance of certain tests, and that under these circumstances bi-factor solutions will tend to more meaningful results than orthogonal solutions.

The fundamental difference between the Thurstone method of obtaining factors and the bi-factor method seems to be this. The former attempts to fit a psychological interpretation to a mathematical hypothesis. The latter attempts to fit a mathematical interpretation to a psychological hypothesis. Since we are primarily interested in proving or disproving psychological hypotheses the bi-factor method would seem, from the point of view of psychology, to be the more valid scientific method, and more likely to produce useful results.

VI. SUMMARY

1. The intercorrelations between the split-halves of three equivalent group tests of intelligence given on different days are analysed by Holzinger's bi-factor method, and factors of 'temporal contiguity' isolated and measured.

2. The existence of factors of 'temporal contiguity' may be due to the absence of the influence of functional variability on the correlations between tests given on the same day, or to the correlation of errors, or both.

3. The existence of factors of 'temporal contiguity' explain why reliability coefficients calculated by the split-half method, and 'boosted' by the Spearman-Brown formula, are usually higher than reliability coefficients obtained by correlating parallel forms.

4. A comparison is made between bi-factor and multiple factor techniques.

5. Reasons and calculations are advanced to show that the reduction of the number of factors to a minimum may under certain circumstances lead to meaningless factors, quite incompatible with a previously established psychological hypothesis.

6. The argument is presented that from the point of view of psychology the fitting of a mathematical interpretation to a psychological hypothesis, rather than the converse, is the more valid scientific method, and likely to lead to more meaningful results.

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(3) Thouless, Robert H. (1936). "Test unreliability and function fluctuation." *Brit. J. Psychol.* xxvi, 325–43.

(4) Holzinger, Karl J. (1938). "Relationship between three multiple orthogonal factors and four bi-factors." *J. Educ. Psychol.* xxix, 513–19.

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PUBLICATIONS RECENTLY RECEIVED

The Measurement of Abilities. By P. E. Vernon. University of London Press. 1940. Pp. 308. 10*s*. 6*d*. net.

This is an admirable book which should relieve teachers of educational psychology of the difficulty of finding a suitable text-book for their classes. It provides an interesting and clearly written account of the use of statistical methods, of mental testing, and of examining. The account of statistical methods should be valuable to those students who find Fisher too hard, but who want an account of the matter which is practical and sound, and who also prefer one that is illustrated from the field of educational psychology.

Criticisms of this part of the book must be mainly on questions of relative emphasis on which there would be considerable disagreement between different educational psychologists. I should have preferred to see a fuller account of the method of testing significance in small samples. It is true that, in educational psychology, one is generally dealing with relatively large samples, but not always, and ability to deal adequately with small samples is a useful part of the equipment of every psychological statistician. In experimental psychology, it is, of course, essential.

Much space is rightly devoted to the correlation coefficient since this is the method which has been most widely used in educational psychology. Dr Vernon also very properly points out that adherence to the correlation coefficient commonly leads to neglect of more appropriate methods of dealing with particular problems, such methods, for example, as the analysis of variance. It might have been better to have given a fuller description of the analysis of variance, not only because it is a method which should very often be used, but because it is the expression of a way of thinking which is essential to the proper understanding of the use of correlation coefficients. Much of the blind error in the use of correlation coefficients in the past (such as Winfield's determination of the correlation between the intelligence coefficients of pairs of twins from a single orphanage) would have been avoided if investigators had realized that, in calculating a correlation coefficient, one is comparing variances.

There is an interesting and useful chapter on factor analysis. In dealing with the difficult problem of multiple factor analysis, the author has adopted the wise course of explaining what multiple factor analysis is getting at without giving instructions in the actual methods of carrying it out. I do not think that there is anywhere else where this is done for the student. If he wishes to learn the actual techniques, he will be in a much better position for doing so after he has understood Dr Vernon's chapter.

Dr Vernon argues again the case against the traditional examination as an adequate measuring instrument. It might have been better to omit much of the anecdotal evidence, such as the story of the examiner who wrote for his own guidance a model set of answers which were marked variably and sometimes severely by his colleagues. It is difficult to know how far such selected evidence is truly representative. Even the more respectable evidence of correlation coefficients may often be symptomatic of bad examining rather than of a necessary defect in the examination. Independent marking of university examinations by competent examiners is found to give considerably higher correlations than those ordinarily published. On the other hand, it may also be pointed out that the matter may be worse than correlation coefficients indicate since these indicate only the reliability of independent examiners' marks, not their validity. Unless papers are independently marked from typed copies, we cannot know how much of such agreement as there is may be due to both examiners being influenced by handwriting and neatness rather than by the candidates' knowledge of the subject. The main practical problem for the examiner is to use such techniques as will reduce the unreliability of his marking as much as possible. On this point, Dr Vernon gives practical guidance which would much improve marking if it were followed.

Towards the end of the book, there is a new-type examination on its subject-matter which the reader will find it amusing to carry out himself. There is a key to right answers at the end. Perhaps in a future edition the author will add norms.

This is a thoroughly useful book which fills a gap of which teachers of educational psychology have been long conscious. R. H. T.

An Annotated Bibliography of Mental Tests and Scales. By CHARLES K. A. WANG. Peiping; China: Catholic University Press. 1939. Pp. vi+725.

More than 1770 references are given and their contents briefly described. The general topics more or less covered in this first volume are: the Measurement of Mental Capacity; the Measurement of Personality and Character; and the Measurement of Vocational Aptitudes and Abilities. A list is also included of the publishers and manufacturers of test material.

Whether the preparation of this kind of bibliography is genuinely worth the labour that must be lavished upon it is perhaps doubtful, but it is certain that Professor Wang and his collaborators have accomplished the job itself in an exceedingly satisfactory manner. The annotations are brief but clear, and where they cannot be first-hand this is indicated. Anybody turning over the pages of this book will probably get a very strong impression that research workers in this field have been more anxious to invent tests than to do anything else, and also that the number of tests is altogether out of proportion to their originality.

It is probable that the bibliography will be most useful to the student who wishes to get a quick specialized survey and then to follow this up by study of original papers in a more limited field.

General Psychology. By L. E. COLE. London: McGraw Hill Publishing Co., Ltd. 1939. Pp. xii+688. 21*s*. net.

This is a comprehensive, judicious, and lucid general text-book. Prof. Cole reveals a wide knowledge of his subject-matter, a healthy bias towards treating the subjective in an objective a fashion as possible, and a great ability to keep his head amidst the wildest swirl of theories. On the whole, the arrangement of this text-book follows a fairly well established modern pattern. There are the initial physiological data, very well presented, the early stress on general and particular biological development. Then come the psychological parts proper: emotion, motivation, learning, and, as compared with the traditional type of text-book, perception at a late stage. There are both fuller and better discussions of thinking and reasoning than have been customary, and the final chapters deal with intelligence and personality. The book is undeniably a good one for the intermediate and advanced student who can read with some independence of mind. He may find parts of it over long, but he will get a good picture of current psychology and may well be stimulated towards an attitude neither over-critical nor merely submissive.

Representative Psychologists. By A. C. WESTERHOF. Maryland: Pilot Publishing Company. 1938. Pp. vi+119.

The title is not a very good one, for the book is about psychological theories rather than about psychologists. The theories selected are: Personalistic, mainly represented by William Stern; Gestalt, represented by Köhler and Koffka; Mental Measurement, represented by Terman; Purposive Behaviorism, represented by Tolman; Psychoanalytic, represented by Freud, Jung and Adler; and Hormic or Teleologic, represented by August Pauly and William McDougall. The author, while very generally critical, is more sympathetic to the hormic than to any other point of view. The essay is worth reading, but on the whole tends to exaggerate the differences between one group and another in modern psychology. The fundamental problem to the author remains the apparent opposition between mechanistic and teleological views, and he calls for a reorientation in regard to this based upon a re-examination of the "nature of thinking itself". However, there is not very much indication of how the re-examination is to be carried out.

The Individual and His Society. By ABRAM KARDINER. New York: Columbia University Press (London: Humphrey Milford). 1939. Pp. xxvi + 503. 22*s*. net.

This book is a co-operative effort. It contains a fair amount of original sociological and anthropological observation by Dr Ralph Linton, dealing with Marquesan culture and the Tanala of Madagascar, two peoples who look to be conveniently chosen for their wide differences of social organization and character. It also contains more interpretation by Dr Abram Kardiner, who disclaims any special knowledge of anthropology and whose approach to psychology is very strongly by way of a study of the pathological. This has certain disadvantages: the descriptive parts of the volume have to be highly condensed and selected and the interpretative parts often give the impression of being at several removes from the facts, as if the author had achieved a high degree of theoretic formulation before he attempted his concrete task. Nevertheless, the book is a highly interesting one and the authors themselves very frankly state its shortcomings and incompleteness. It falls in general into line with many other recent books in strongly using the notion of group personality. It insists, both that the psychologist should take account of this, and also that the anthropologist must learn to reckon more shrewdly with the functions of the individual in society. And it attempts to work out these and related ideas, not in general terms merely, but with special reference to the two cultures which are studied in some detail. Incidentally, a number of very interesting observations are made about the relations of culture and neurosis, and there are a few valuable and original observations about special cases of the contact and spread of cultural features. It is a pity that the English price of the book is so high.

Time-Budgets of Human Behaviour. By P. A. SOROKIN and C. Q. BERGER. Harvard University Press (London: Humphrey Milford). 1939. Pp. vi + 204. 10*s*. 6*d*. net.

On the basis that man is an active animal the authors set out to attempt to establish what proportion of time is normally allotted to a large number of everyday activities in certain communities. A considerable amount of the work was done in Soviet Russia and the rest in the U.S.A. The result is an exceedingly interesting book. Various methods were exploited, questionnaires, diaries, immediate records of one kind and another and most of the common things that men can do have been more or less fully covered. The book has four essential parts, dealing with (*a*) the structure and composition of human behaviour in terms of the relative expenditure of time on its leading component parts; (*b*) the motives that lie behind the main overt activities; (*c*) a comparative study of social and non-social activities; and (*d*) comments on the predictability of human activities and social processes. The authors remain somewhat unimpressed by the modern claim to foresee and plan ahead the activities of man, for they find that most of the primary activities (in terms of time) are relatively inelastic. The evidence is presented most clearly and in a highly condensed manner and the comments that are made are straightforward and definite. It is to be hoped that the book will set other people working on similar problems in other communities. Time may be no great criterion of value, but undeniably it has a lot to do with what is possible in the way of human development.

Psychological Foundations of Personality. By LOUIS P. THORPE. London: McGraw Hill Publishing Co., Ltd. 1938. Pp. xvi + 602. 21*s*. net.

Prof. Thorpe describes his book as a Guide for Students and Teachers. The description is accurate, but at the same time the book has an interest and a value that run beyond the preparation for examinations. It is clearly planned. The author discusses first the current general views about the basis of personality; then considers the biological foundations of personality; proceeds to a fairly wide survey of educability, largely in terms of the training of intelligence; next considers dynamic and emotional factors, and the significance of special "traits"; examines both disturbances of personality and its integration; appraises certain physiological theories; and finally reaches some tentative conclusions with regard to problems of measurement in this field. The actual writing, though in no way distinguished, is usually clear, though in places definitely long-winded. The work surveyed is very large in quantity and the surveys are judicial and within their limits very fair to the authors dealt with. While the volume is not exciting, it is informative to a high degree.

Secrets of the Mind. By C. E. WAGER. London: Watts and Co. 1940. Pp. 159. 5*s*. net.

The 'secrets' are, of course, mainly concerned with those mechanisms which are now usually called Freudian. Whether 'secret' is the correct word to use about them now, when more has been written concerning them than concerning most other things in psychology, is perhaps slightly dubious. Anyhow, the secrets are in this book partially and as it were discreetly unveiled. Most of the chapters are short and read somewhat like lecture notes. They deal with questions connected with family life, with marriage, with motives, with religion, with neuroses and finally, and very briefly, with dictators, who appear to be more or less explained by being called wrong super-egos, or substitute super-egos (it is not quite clear which). Taking it all through, the book may well be useful if it is to be read in conjunction with a well-run critical course; but as reading for the person who is not much trained and has little access to anything else it is not to be recommended. Its sincerity shines all through, but it is neither as clear in its exposition nor as critical in its outlook as could be desired.

Hopousia; or, the Sexual and Economic Foundations of a New Society. By J. D. UNWIN. London: Geo. Allen and Unwin. 1940. Pp. 475. 21*s*. net.

Any review of this work would be difficult, but an adequate short notice is impossible. Its scope and aim may be indicated, and the reader who feels attracted be left to form his own opinions. Hopousia, we learn on p. 119, is a "hypothetical or experimental society" which is so built that it can display "the greatest possible energy". Precisely how this criterion can be applied is not very clear, but it does seem clear that in many details Hopousia would contain compromises. For example, *alpha* and *beta* marriages are contemplated, the former fixed, binding, unbreakable, the latter shifting, occasionally transitory; but it is the former alone that seem consistent with the author's notion of greatest possible energy. On the whole, the bulk of the work is concerned with economic considerations, and the bulk of these with exchange problems. Beyond a doubt an extremely large number of acute critical comments are made upon institutions and customs of present-day society, but the constructive side of the book, though it is much to the fore, is not as fully worked out. Actually, Unwin did not finish very much of the publication, and a large part of it should not be regarded as a final presentation of his views. Aldous Huxley writes a long and commendatory preface.

A Study of a Group of Children of Exceptionally High Intelligence Quotient in Situations Partaking of the Nature of Suggestion. By RACHEL M. SIMMONS. New York: Teachers' College, Columbia University, Contributions to Education, No. 788. 1940. Pp. x+112. $1.60.

If a reader thinks that the extraordinarily cumbrous title of this monograph indicates a mind careful and anxious to be extremely accurate he will be right. If he considers also that it may suggest a mind cautious to the extent of being uninteresting he will be wrong. The monograph is in fact both illuminating and attractive. To begin with, it gives a very good survey of earlier work on suggestibility in young people, and then it goes on to describe clearly and to discuss a number of experimental investigations carried out with two carefully paired groups of intelligent children and less intelligent ones. The procedures used were the Otis tests I and II and other Street picture tests, progressive weights and the Chevreul pendulum. Throughout, the more intelligent children showed smaller tendency to accept suggestions, and greater tendency to resist suggestions in a positive way. The author interprets these results most reasonably and with extreme care. She is very desirous of not running beyond her own particular groups and her own arranged situations; nevertheless, she does seem to have provided convincing experimental evidence on the basis of which it would be safe to venture wider generalizations.

Marriage and the Family. By RAY E. BABER. London: McGraw Hill Publishing Co., Ltd. 1939. Pp. xii+656. 24*s*. net.

Here is a general text-book on very nearly all aspects of family life or lack of life. And if a text-book on these subjects is desired this is an excellent one. It covers a vast range, historical, economic, physiological (but not very much of this), psychological, and social, and covers this range well. It is full of information, and some of this, especially that concerning earlier and current American custom and institution, is particularly interesting to readers in this country. On the whole, the family as a social institution of fundamental value comes well out of the survey, and the author, though he meets his problems with a critically open mind, is definitely on the side of what he calls the "conservation of family values". Except for the specialist the book is on the long side, but no psychological student can fail to be interested and enlightened by many parts of it, and general psychological libraries would do well to place a copy on their shelves.

The Rape of the Masses. By SERGE CHAKOTIN. London: George Routledge and Sons. 1940. Pp. xviii+299. 7*s*. 6*d*. net.

The Rape of the Masses has enjoyed great popularity in France and is now translated into English from that language, and translated very well. It is topical psychology with a vengeance. Its sole subject is propaganda and its sole explanation conditioned reflexes. Only instincts and especially "no. 1 instinct, the combative instinct" take the place of reflexes. Whatever may be thought about the theory, and it is likely that most readers with psychological training will find it continually exaggerated and over-strained, there is no doubt that much of the author's factual evidence is of absorbing interest.

Guiding Human Misfits. By ALEXANDRA ADLER. London: Faber and Faber. 1939. Pp. 128. 5*s*. net.

While there is nothing very original or striking about this book it is written in a clear and straightforward manner. Dr Alexandra Adler follows her father, to whom she has dedicated this book, very closely, and her present work consists largely in briefly described case-illustrations of various difficulties which have been successfully treated along the lines of Individual Psychology.

Alfred Adler: the Man and His Work. By HERTHA ORGLER. London: C. W. Daniel Company, Ltd. 1939. Pp. 241. 8*s*. 6*d*. net.

Alfred Adler. By PHYLLIS BOTTOME. London: Faber and Faber. 1939. Pp. 386. 10*s*. 6*d*. net.

Both books have sub-titles: that of the first is Triumph over the Inferiority Complex, and that of the second is Apostle of Freedom. Both books are what may be called 'praise biographies'. Mrs Bottome's book is perhaps the better written and certainly gives more personal details of its hero in a more consecutive and orderly fashion. Mrs Orgler is perhaps a little more concerned to extol the soundness of Adler's principles and the efficacy of his methods. This she does partly by descriptions of her own applications of his ideas in medical practice. The many admirers of Adler's work will find much to attract them in both of these biographies.

How You Grow Up. By VICTOR CHAMBERLAIN. London: Gerald Howe, Ltd. 1939. Pp. v+121. 2*s*. 6*d*. net.

It is difficult to see what possible useful purpose a book like this can serve. It is called "an Introduction to Psychology for young people and their parents". It is said to be "suitable for all ages from thirteen". In fact, it consists of a number of exceedingly brief, exceedingly general and exceedingly inadequate chapters on very widely selected topics. Any intelligent thirteen-year-old, if he is in need of anything specifically in the name of psychology at all, deserves something better than this. His parents possibly may be more interested, but they will not be able to learn anything much.

Children in the Cinema. By RICHARD FORD. London: Geo. Allen and Unwin. 1939. Pp. viii+232.

It is estimated that in normal times very nearly five million children attend cinema performances each week in this country. Here is a survey of and a tentative answer to a great many problems of social and psychological interest which result. The author apologizes for his lack of expert knowledge of child psychology. No such apology was needed. The book is most admirably clear, very much to the point, full of interest, and it will suggest to the psychologist who cares for the world outside as well as that inside the laboratory a number of very worth-while lines of investigation. In fact, this is a book to be studied and also to be enjoyed.

Sleep and Wakefulness. By NATHANIEL KLEITMAN. University of Chicago Press (Cambridge University Press). 1939. Pp. xi+638. 30*s*. net.

This is a very excellent book. It passes in review, swiftly but lucidly, an immense amount of observational and experimental research concerning the physiological, pharmacological and psychological characteristics and functions of the sleep-wakefulness periodicity. It includes a most interesting chapter on the experimental deprivation of sleep, which shows how, as lack of sleep increases, the pain threshold is usually lowered, irritability grows, hallucinations may appear, and in general the signs indicate growing fatigue of the higher levels in the central nervous system. Sleep-like states, including hypnosis, are judicially considered, and there is much about abnormal sleep and wakefulness. Very likely the general reader may find the final part of the volume, which deals with theories of sleep, the most interesting. The author critically considers neural and humoral theories, the sleep-centre problem, and an evolutionary theory which treats sleep and wakefulness as natural alternating phases in a biological cycle. Dr Kleitman's adverse criticism of the widely accepted inhibition theory of Pavlov is incisive and seems entirely convincing. The author himself favours a form of the evolutionary theory, but freely admits that there are many gaps still to be filled.

The Psychology of Art. By ROBERT MORRIS OGDEN. New York: Charles Scribner's Sons. 1938. Pp. xviii + 291. $2.50.

Most of the traditional problems of psychological aesthetics are discussed in this book. After a general introduction dealing with the wide field of all the Arts, Prof. Ogden discusses in turn Music, Poetry, Visual Art, combinations of the different modes of artistic expression and, rather briefly, aesthetic education. He looks everywhere, not for items of expression and brief incidents of enjoyment, but for patterns which may be exceedingly complex in themselves and for 'enjoyed' responses which may contain a great many components welded together so that their secret lies in their unity, not in their units. "Musical tones determine among themselves patterns of melody and harmony which, when apprehended, open a wide prospect of aesthetic enjoyment." "Great literary art reduces itself to a verbal pattern which we can fully enjoy." Visual and the combined arts display the same characters. Yet Prof. Ogden does not despise the study of the component detail, but on the contrary considers it essential and devotes much attention to it. The whole treatment cannot be regarded as particularly original, but it is vigorous, clear and pleasant to read. If there are key-words, they are 'orderliness', 'seemliness', 'balance'. The volume is exceedingly well produced and illustrated.

The Psychology of Music. By CARL E. SEASHORE. London: McGraw Hill Publishing Co., Ltd. 1938. Pp. xix + 408. 24*s*. net.

There is no need to attempt to praise a book on this subject by Prof. Seashore. His work is already so widely known, so warmly appreciated in all the civilized countries that it is enough to record publication. The volume consists of a very considerable number of essays, some of which have been published before but are not easily accessible, on a great number of different topics both of technical and of general interest, connected with music. On all of them Dr Seashore writes with great knowledge, *verve* and distinction, and his book is sure of a wide welcome.

The Ultra-perceptive Faculty. By J. HETTINGER. London: Rider and Co. 1940. 12*s*. 6*d*. net.

This is an experimental investigation of what in psychical research is called 'psychometry'—the alleged power of a medium to give information about the owner of an object on which the medium has concentrated. The general principle of the methods used has been to present the owner of the object with the statements made by the medium about him and with a number of control statements not made about him and to determine whether he accepts a significantly greater number of the statements which are meant to apply to him. There is considerable variation in detail of the method, but it seems clear that there is definite evidence of the existence of this power amongst professional mediums when the conditions of the experiment are entirely adequate. The statistical treatment is also adequate although somewhat stereotyped and insensitive.

The fact of the power seems to be proved, but there are many interesting statements about it, of which no numerical proof is given, under the head of 'further observations' at the end of each chapter. Some of the conclusions in the latter part of the book are very questionable since they seem to assume that every time a statement is 'accepted' by the person to whom it refers, genuine ultra-perceptive cognition is at work, whereas the number of statements accepted in the control group suggests that only a small proportion of the correct statements are genuinely cognized and that the remainder may be true by mere chance. R. H. T.

Diseases of the Nervous System. By W. RUSSELL BRAIN. Second Edition. Oxford Medical Publications (London: Humphrey Milford). 1940. Pp. xx+950. 30*s*. net.

The second edition of this well-known and valuable text-book has been widely and carefully revised. It contains now a chapter on the Psychological Manifestations of Organic Nervous Disease, discussions of modern electro-encephalography, references to the effects of vitamin deficiencies in relation to nervous disorder, and brief accounts of the progress made in the study of neurotrophic viruses. A few sections, less immediately neurological in character, have been omitted.

The psychological chapter, though it is clear and accurate, is necessarily brief and can claim no originality. Moreover, the tests and methods of investigation referred to are hardly given sufficient detail to guide their application. However, all the necessary references are appended from which readers who desire it may obtain more detailed information. The volume should continue its successful career.

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SOME SOCIO-PSYCHOLOGICAL PROBLEMS OF FACTORY LIFE

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I. PROBLEM

THIS article aims at a descriptive analysis of the factory situation as experienced by the factory girl. While the number of psychological investigations into factory problems is increasing, they frequently seem to be conceived without the necessary background of knowledge about factory life. Apart from those studies, which ought to be called studies in scientific labour management rather than psychological studies, there are two main groups of investigations: One group devises ingenious experiments which lead in the end to the conclusion that the factory worker is not a machine functioning with mathematical accuracy, but a human being; it seems that such a 'result' could have easily been assumed by anybody setting out to investigate, especially by a psychologist. Another group of investigations selects a special problem without adjusting the concept and methods to the specific factory situation. In an otherwise excellent study of boredom in repetitive work, for instance, the authors include amongst other questions to the workers one as to their preference for promotion or higher wages.[1] Promotion and higher wages cannot, however, be co-ordinated if the social situation in the factory is taken into account. An average worker has a negligible chance of promotion, but has really experienced, and has a far greater chance of again experiencing, what an increase in wages means. The first question, therefore, relates to the sphere of unrealizable imagination, the second to that of actual experience. The decision, when one is confronted with such an alternative, is meaningless because it has no relation to social reality.

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[1] Wyatt, S. and Langdon, J. N. (assisted by Stock, F. G. L. (1937)). *Industrial Health Research Board*, Report No. 77.

The frequent method of approach by interviews or even by questionnaires constitutes another shortcoming of many an investigation. A method which has developed with undergraduates (who naturally are the most handy human 'material' for experiments in psychology), and is admirably fitted for investigating the educated and sophisticated mind, must fail when applied without alteration to the worker. The tendency of the latter to give the 'right' answer, to say what he thinks he is expected to say, is naturally great, and is increased when confronted with a scientist who generally is also a middle class person and an obvious outsider. A good example of the falsification of results thus gained was afforded by a factory girl who told the following story: "Some years ago a psychologist came into the factory. He wanted to know about my day dreaming. I did not quite know what to say, so he just told me what I was thinking about when working, and I only had to say yes. I often think of what he has told me, even now. Such a clever man."

This somewhat unexpected effect of scientific research on the behaviour of a working class girl is a far more interesting result than the statistics about day dreams which probably have been established after this sort of application of the method of direct interview.

Although there exist, no doubt, investigations which are free from similar shortcomings, the frequency of the type characterized justifies the undertaking aimed at here, namely, to describe some features in the personality of the factory girl against the background of the social situation. Such a description must necessarily be limited to a selection of features which have been deliberately chosen. It probably includes enumeration of details which seem to be trivial and self-evident; this, unfortunately, is unavoidable when a comprehensive picture is required, where the trivial and the extraordinary, the known and the unknown, constitute together the actual social setting.

II. METHOD

The method used in the study on which this report is based was that which has been termed 'functional penetration'.[1] The investigator worked for several months as a factory worker.[2] The management of the factory permitted the research project to be carried out; the workers, however, were not informed, in order to keep the situation as unaffected as possible by the observer. After the first month it became advisable to explain the research project to some of the workers. By then, a friendly contact had been established which made them interested in the purpose of the investigation without raising suspicion. Mutual home visits between some of the girls and the investigator supplemented the material.

The material presented here was collected in one factory only; thus it might appear that none of the conclusions can be generalized for other factories. But the problems as presented here are assumed to be universal in factory life, although they may be tackled and solved in different ways elsewhere. A further limitation of this investigation is that the material was collected by one observer only. Friendly criticism on the part of the factory management helped to settle doubtful points. No attempt has been made to distinguish between individual and typical features of this particular factory; such a distinction would not be justified by the present state of research into the problems involved.

III. SOCIAL PATTERNS IN FACTORY LIFE

(a) *The dimensions of the group organization*

Every group organization can exist in two dimensions. There is co-ordination between members of the group, a *horizontal* contact; and a subordination, a social hierarchy, or *vertical* contact. In each of the two dimensions there can be a loose or a close relationship. Each can be accompanied by a positive or a negative attitude, which is, of course, independent of the strength of the relation. Criteria for the strength of the relationship are the frequency of face-to-face contacts, and the frequency of verbal references to a member. The positive or negative attitude is found out by qualitative analysis. The co- or subordination is determined by the function of a member within the group.

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[1] Oeser, O. A. (1937), *Brit. J. Psychol.* xxvii, 343.

[2] As the firm prefers to remain anonymous, no detailed description of it can be given here. A few indications must suffice: The firm employed about 400 workers in that particular factory, the great bulk of whom were women. The work was repetitive, though mitigated by the fact that no brand article was produced. Orders varied in material, size, and colour considerably. I want to take the opportunity here of expressing my warm thanks to the management and the women and girls working in the factory, whose sympathetic attitude made this investigation possible.

This descriptive scheme could be extended further by taking into account the minor divergencies in the vertical dimension amongst group members. The strength and the attitude qualification of the relationship could be described in a less generalized way by introducing more than two degrees. The scheme would thus certainly gain in detail, but it would always remain in the nature of a formal description. From such a description one cannot obtain an answer to the essential question in social psychology, namely, how to understand the origin of this particular type of group relation, and what the resulting influence of the group on the individual may be.

For this purpose less formal features of the situation must be considered, those which actually exist within the formal group structure without being necessary consequences of it. A factory is no logical construction but a social reality. The variety of social relations in it can therefore not be reduced to a simple scheme. The concatenation of various elements in a group situation is a social factor in itself which must not be neglected lest one fails to produce the right picture. Thus, though applying the terminology introduced above, an analysis of the socio-psychological problem of the group situation cannot be restricted to the notions implied by 'horizontal' or 'vertical' contact.

(*b*) *The horizontal relationship*

The external sign which unites members in the horizontal dimension is the wearing of an overall. The 'headgirls'[1] wear an overall different in colour and cut from those worn by the ordinary workers. This distinction corresponds to different functions, and is meant and understood as a symbol. The power of this symbol was demonstrated by the behaviour of the beginners, who for the first week or so worked in their ordinary clothes; their shyness generally began to disappear on the day they got their overalls. The scrutinies of the other girls then disappeared; the newcomer was adopted into the community.

Besides the uniform dress there is another symbolic expression of equality amongst all members in the horizontal relation: they address each other without exception, without reference to age or sex, by their Christian names. Headgirls are included in this form of address; but foremen are excluded, they are 'Mr X'. The girl of fourteen thus calls men and women by their Christian names who, from their age, might be her parents, or even grandparents. Thus she is apparently placed on the same social level with them. This creates an atmosphere of intimacy and cordiality which is essentially different from the social norms prevailing in family, neighbourhood, and friendship contacts outside the factory. This intimate way of addressing each other facilitates conversation, and thus gives the factory girl a unique opportunity of being friendly with persons of various age groups of both sexes, and of participating to a certain degree in their life experience.

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[1] The term used in this factory for forewomen and women overseers.

These symbolic expressions of the feeling of equality among the factory girls must not be mistaken for the cause of the equality. They only make more obvious a fact which soon becomes known to each worker. The equalizing factor is not their financial situation, which indeed varies considerably between men and women, girls under and above eighteen years, and according to the size and earning power of their families. This equalizing factor is rather the knowledge that they are necessary not as individuals, but only for the performance of a function which almost anybody could fulfil equally well. This is different, of course, for the highly skilled worker, who cannot easily be replaced; he therefore tends to develop a greater personal self-confidence. The factory girl, however, even if she acquires a certain skill, has no illusion about her importance. She knows that she is not needed as a person; therefore she finds it extremely difficult to establish a personal relationship towards her work.

The attitude of solidarity which develops out of this feeling of equality extends even to those who are not liked as individuals. For instance, when one girl who had rather a nervous and queer manner was discharged, obviously because of this manner, all the sympathy was on her side. The same happened in another case, where a girl had been dismissed because of her lack of cleanliness, which had been criticized before by the girls themselves.

The knowledge that one is not necessary tends to decrease the self-respect of every individual who encounters such an experience. This may be compensated by the human contact between those who as a group share this experience; they respect each other.

The piecework system introduces a possibility of breaking up this solidarity. It was much criticized because "it isn't fair", or, as one girl put it, "If one gets more than another, there might be quarrels." In practice, however, this did not happen. The girls, who openly discussed all their purchases with each other, never mentioned their exact wage sum unless it was lower than the average.

This attitude towards piecework should not be taken as a final condemnation by the workers of the piecework system; it is partly an expression of the universal pleasure in grumbling. In a work scheme for unemployed miners in South Wales which I studied, the opposite attitude was met with. The miners were used to the piecework system, and were made to work on a scheme by which they benefited according to their needs, and not according to their work. The predominant opinion amongst the unemployed was that the system was not just. Thus the attitude towards piecework is highly complicated.

The factory girls who benefited from the piecework system remarked in more than one case that they had a bad conscience because of this. On the other hand, a good piecework result tends to increase self-respect. Whilst a bad result was invariably attributed to bad luck or unfair treatment, a good result was generally attributed to one's own good working capacity. Solidarity on the one hand, and the desire for acknowledgement of individual achievement on the other are thus in a conflict. The girls are conscious of this and often discussed it.

Membership of trade unions is the organized expression of the feeling of solidarity. As everywhere else, the percentage of girls in the trade unions was lower than that of the men. The reports of difficulties in canvassing illustrate the fundamentally different outlook towards work between the two sexes. The girls do not join because "they do not bother" or because, as they say, "I can do better with my 6*d*." Whilst the man has accepted work as a part of his life, 'real life' for the factory girl starts with the moment she leaves the factory at the end of the day. Although she might be willing to prove her solidarity in every concrete situation, she refuses to look farther than that. Her ambition and her dreams belong to a different sphere. It is significant that most of the girls did not know which of them belonged to a trade union. Thus, this factor has no influence on the general harmony of the horizontal contact.

Throughout the factory the equal value of each individual belonging to the horizontal dimension, irrespective of age, sex, family situation, wage difference, and even skill, was fully recognized. The relationship is thus 'equalitarian'.

(*c*) *The vertical relationship*

(1) *Relation to foremen and headgirls.* The foremen and headgirls in a factory are financially privileged. This difference, however, does not affect the mutual attitude; the amount of the wage difference is unknown to most of the girls. Besides, a headgirl receives no more than many a

man who is included in the horizontal contact, whilst she is excluded. The decisive distinction lies in their function. Headgirls and foremen know that it is not easy to replace them, that the smooth running of the factory organization depends to a large degree on their presence, experience, and organizing capacity. This naturally not only increases their self-esteem, but also induces them to look down on those whose work is of a less individual character. "I don't think anybody could take my place now" was a typical remark of a headgirl.

Foremen and headgirls show an attitude of interest towards their own work, which distinguishes them clearly from the predominant attitude of lack of interest in work shown by unskilled workers. The problem of boredom does not arise to the same degree for them. The influence of this fact on the harmony and unity of their personalities is undoubtedly great, yet difficult to prove. A few examples which seem typical of the 'foreman's way of thinking' may tentatively indicate in what direction the difference lies:

A foreman, in explaining a new type of work with the help of a paper model, discovered on this model the words 'marque deposée'. He read them aloud, and commented: "This is French. Once I was in France. Those French people are different from us..." (and went on speaking about his experiences in France).

A foreman listened to another man's profoundly moving tale connected with a picture post card found during the last war on a battlefield; whilst the others were only interested in the emotional side of the story, he investigated print and material of the picture post card: "A good piece of work, the Germans have always been good in printing", he said.

A foreman mislaid an order sheet, needed by a worker: "Where can it be?" he said, "I hate losing anything. There are always troubles then. Once I mislaid my key at home..." (followed by a story of what happened).

The common feature of these incidents is that a generalized thought was provoked in connexion with work. Associations were stimulated by an incident, and connected work with life in general, or vice versa. This process, the combination of life and work in one chain of associations, is, of course, not proved by a few examples. But judging from the general outlook of unskilled workers and foremen, it seems to be the most essential difference in their respective attitudes and personalities.

The attitude of the girls towards their work as regards the interest it arouses may be illustrated by the following observation:

A group of eleven girls who were working for ten days on a special order concerned with an advertisement, were asked afterwards whether they knew what was advertised on each of the many thousand objects they had been handling. None of them knew.

This again is only an illustration of the effect of mechanical mass production on the personality. It results in an almost complete split between work and life. The head does not know what the hands are doing; at least, one part of the mind is excluded from participation in the working process. The other part has to control and check an almost but not completely automatic activity. This justifies the assumption that there are two parallel but unconnected levels of thought. Further investigation would be necessary to verify the implied conclusions as to a split in the personality.

The difference in the function and outlook of the girls as compared with that of foremen and headgirls, leads us to expect a difficulty in their understanding of each other. This expectation is fully justified by observation; the attitude in the factory was one of mutual resentment, and sometimes hatred. The foreman's attitude to the worker varies naturally with the personality of the foreman. It is possible that some personalities may succeed in bridging or at least disguising the fundamental conflict between the two groups. But the foreman and headgirl are generally excluded from the cheerful 'good morning' and 'good night' wishes. Neither of the two parties takes any care to disguise their feelings towards each other. The situation is made more difficult through the closeness of the daily contact and through the fact that some of those who are now foremen or headgirls in charge of the others used to work formerly as ordinary employees in the same factory. Many remarks and incidents showed clearly that the girls have much less objection to an authority which comes from a different social class. In some cases the bad manners and bad language used by individual foremen afforded a good excuse for the rationalization of the hostile attitudes of the girls. On the whole, however, it seemed to be more the difference in outlook and function than the faults of individuals which gave rise to many complaints, amongst which favouritism, having to wait for work, and general lack of consideration, were predominant.

Thus, the relation between the girls and those workers put in charge of them showed the following features: resentment, lack of mutual understanding, a feeling of superiority on the one side, of inferiority on the other. The actual power of those in charge is great. The girls depend on the foreman's decision and likes, and there is no attempt to explain or to understand such decisions. Although the labour management and the trade unions are supposed to act as a court of appeal, practically no use is made of that possibility. The relationship appears to be 'dictatorial'.[1]

(2) *Relation to the management.* The relationship of the girls to the management is much looser than those previously discussed. But apart from the loose actual face-to-face contact there exists, of course, a relation in thought, based on the knowledge of dependence and of the superior social position of the executives of a firm. It seems that the attitude of the girls towards the management is ambivalent; they possess two sets of attitudes, even two forms of language, where the management is concerned. Talking about a concrete situation they refer to the management always by their proper names; talking about the management in a more general fashion, names are never mentioned. The vague form 'they' is then used. The first type of language is chiefly combined with a positive, the second with a more critical attitude. Reference in this second form is rare, however, and occurs only in the infrequent conversations about trade unionism or working conditions. Such conversations reveal a stereotyped attitude towards employers in general: antagonism between the interests of the workers and the employer is unquestioned, trades unionism is the only conceivable means of help in this conflict, and on the whole a successful means. The continental observer is struck by the lack of political slogans in such talks.

The attitude of the girls based on concrete experiences with their own management is entirely free from the resentment expressed in the theoretical sphere. This is partly due to the fact that the particular management was actually very considerate, and partly to the fact that the girls have a deep respect and admiration for the social class to which the representatives of the management belong. The contrast in manners between foremen and executives increases this respect considerably. The foremen are not gentlemen, but the managers are.

The girls in describing their attitude towards representatives of the management used the term 'gentleman' frequently, thus revealing the nature of the relation to the management. It is a 'patriarchal' relation; unquestioned authority, feelings of respect and admiration, appreciation of the personal contact, are its predominant features. The ambivalence and latent rebellion against it are less obvious here, but not uncommon in other decaying patriarchal relations.

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[1] The view of the management of the factory diverges here from that of the investigator. They are of the opinion that the attitude of the girls towards foreman and headgirl is not a result of their different functions, but only of the particular personalities observed. They further maintain that the actual power of the foreman over the girls is too limited to justify the term 'dictatorial relation'.

IV. THE TIME EXPERIENCE OF FACTORY GIRLS

Some evidence has been collected about the frequency and type of manifestation of boredom. As Wyatt's and Langdon's study, quoted above (footnote, p. 191), gives a detailed account of it, only a short summary will be given here. The experiences of boredom and fatigue are entirely different. Boredom was a constant problem for most of the girls throughout their working week; fatigue was hardly mentioned under normal conditions, and became a subject of discussion only when the factory worked overtime.

The attitude towards overtime illustrates best the difference between the experiences of boredom and fatigue. The actual overtime period lasted for an hour and a half, four times a week. It was preceded by half an hour in the canteen for tea, and followed by going home. The girls complained about it because—as they said—fatigue prevented them from making this time pay satisfactorily (they worked under piecework conditions). Asked about their time experience, however, they unanimously declared that it was highly positive. "It passed so quick, like nothing"; "just like lightning it was, not more"; "passes so lovely, was over before it had really begun", etc., were typical remarks.

Boredom thus does not seem to be in proportion to fatigue, but rather to depend on the length of the working spell. The normal working spell was over four hours, without any interruption. Boredom is experienced when the present has no value of its own, and does not demand the full mental, emotional, and physical energies of the individual, the typical state for a worker on repetitive work. The present, however, is a relative notion; it comprises a time interval that can be easily conceived of as a unit. It is well known that the beginning and the ending of a time spell are clearly marked and distinguished in their psychological significance from the time in between. How long this starting and ending effect lasts, is difficult to ascertain. In the case of the factory girls on overtime, however, it was clear that these effects helped to reduce to next to nothing the boring interval in between the two marked points. A similar effect was produced when a group of girls had one day to report their output hour by hour to the headgirl, in order to ascertain piecework rates. This morning was again felt to be completely free from boredom.

Another means of overcoming boredom is, of course, to make the present a vital experience; this possibility is necessarily very limited for factory workers on repetitive work. It could be observed, however, when girls started a new job or had to learn a new manipulation. Two girls were observed who were being put on a more difficult job for the first time. They had to perform a motion consisting of nine consecutive movements which demanded a certain skill. They had received careful instructions beforehand. They worked at it with keen interest, and did not listen to other girls talking to them; the others watched them with interest and envy; everybody would have liked to do this.

The general longing to work at short instead of at long orders is again to be understood as an attempt to avoid boredom. Some of the most often repeated remarks between the girls were: "How does the time pass for you to-day?" "How does the time pass at this job?" "The time does pass slowly to-day." "The time passes like nothing to me this morning." The latter remark being, of course, less frequent.

The prolonged experience of trying to pass the best part of the day as quickly as possible made the girls invent a number of clever dodges to facilitate this effort. In one room, for instance, the observer was severely criticized for looking at the watch at 8.30 a.m. "If you start to look at the time at this hour, it won't pass for you at all. We never look before we think it is 11 a.m. Then you are often surprised to find that it is already 11.30. And from there to lunch time is no time at all. In the afternoon you may look when it is 3 p.m. or so."

Other means of escaping boredom were eating sweets, and general restlessness. Sweets were either brought by one or the other of the girls and offered to her immediate neighbours, or—what happened more frequently—were bought during the afternoon in the factory. This involved one girl getting pennies from the others secretly without the foreman or any other person in charge being able to see what was going on; going over to the canteen or to a girl in another department who maintained a secret trade in sweets; in both cases pretending to fetch new material or being sent for an errand; coming back and distributing the purchases secretly; offering them to one another and then sucking them with great satisfaction. This process, thrilling in itself even apart from the actual treat, was generally initiated by one girl, discussed, first rejected, then taken up and carried through. On twenty-five consecutive working days this escape from boredom was adopted eighteen times; three times in the morning between 10 and 11 a.m., fifteen times in the afternoon between 2 and 4.30 p.m.

The capacity for finding an active escape from boredom seems to be in an inverted relation to age. The older girls reacted by becoming depressed and quiet. That this was due to boredom could only be ascertained by verbal statement.

A few observations of behaviour and a number of remarks may illustrate what has been said:

After 3 p.m.: Everybody, especially the youngsters (14–16 years of age) are tired and bored. Every 5 min. somebody looks at the clock. Work seems to slow down. Two girls get up from their stools and put them in a slightly changed position. There is general restlessness. At 4 p.m. a mouse runs through the room. All the girls squeak, and show fear and disgust. A lad of about 15 catches the mouse, and is very much admired by the girls. After this incident talking goes on, and the nervous restlessness is replaced by a cheerful atmosphere. Later on there is singing—"Down Mexico Way".

This incident shows the importance of something happening unexpectedly. "I wish something would happen" was one of the most frequent remarks during the first part of the afternoon. After the war had started, the younger girls would say: "I wish there were an air-raid, now!" An older girl modified this remark in saying: "I wish there were an air-raid warning.".

Another example: A girl of 22 years of age says about 3 p.m.: "I am fed up, I should like to do something exciting. I am bored stiff and I can't stand it any longer." She starts to play about with the working materials, and throws them about. After a while she collects them again and goes on working regularly. At 5.15 p.m. she goes to the lavatory, and comes back beautifully painted, and with more lipstick on. At 5.25 p.m., 5 min. before the end of the working day, she starts to work again at full speed. Everybody laughs at her. She says: "That is because I am a conscientious worker." To me she adds amidst laughter: "It is only to pass away the last minutes quicker."

Another difference between the time experience of younger and older girls is that the former are concerned with the day only, whilst the latter think of the hours of boredom, of the same kind experienced in the past and the inescapable future. In such a mood they would say something like, "Day after day, year in year out, always the same." This general depression was expressed by one woman of about 40 years at 3.30 p.m. in this way: "I am weary, I don't know why. I would like just to sit down and not move for hours." At such a moment remarks about what they would rather have done than be a factory girl were frequent. But the 15-year-old girl when bored looks at the clock and finds that it is only 2.15 p.m., and expresses what she wants by just saying: "I wish it were 5.15 p.m."

It happens occasionally also, of course, that girls have the other experience, e.g. when one girl looks at the clock at 4.20 p.m. and says: "Oh, I thought it was only 2.20. I have worked so hard that the time passed quickly." This was, however, the only remark of its kind heard from a girl not on piecework.

While the young ones begin at 9.15 a.m. to say "the time is going slowly to-day", the older girls seem to have made their peace with the mornings, and only complain about the afternoons. This may also be due to the fact that the normal routine of a factory day gives more variety in the mornings.

The time experience is, however, very much modified under the influence of piecework. A number of girls on piecework had been observed working during the last quarter of an hour of the lunch pause. Remarks like the following were heard not infrequently; "Oh, I am never bored, and time is never too long. I am on piecework, and that makes the time pass frightfully quickly."

Arguments against piecework have already been mentioned, but there seems to be general consent amongst the girls that the good side of piecework is that one does not notice so much how the time passes. What happens on piecework is that the girls start to measure time in money, or even in pairs of silk stockings, or visits to the pictures. This naturally involves no more counting the minutes, but taking hours or even days as time units. Although not all of them are fortunate enough to take small luxuries as the means by which to measure time under piecework conditions, they all work under a pressure which makes them less sensitive towards the boring effect of repetitive work. They have to do a certain amount to earn their normal living, and they often find that they cannot achieve this. Comparison with the output of the others also functions as a stimulus on piecework. In this connexion it is interesting to note that the time experiences of those who are excellent pieceworkers and are generally above the average are much more similar to those of day workers than to those of slow pieceworkers.

V. SOCIAL CONDITIONING OF THE PERSONALITY OF THE FACTORY GIRL

The school leaver who starts factory work has been equipped in school with certain standards of value. She is taught that it is desirable to be industrious and to excel others in achievement and in intelligence; also to keep a certain distance from, and to show respect to, every grown-up person. Care for one's own personal appearance is allowed in so far as it is limited to cleanliness and tidiness; anything else, such as making oneself more attractive or using cosmetics, is prohibited. This scale of values is turned upside down in the factory. To be too industrious and to excel the others in achievement makes one suspect to the other workers in the factory; to be clever is obviously of no use here. To respect age instead of function is out of place. To care for one's appearance is of the utmost importance, in order to succeed in the factory atmosphere.

These conflicting value standards are neither explained nor even openly discussed. Those who observe well and adjust quickly escape being laughed at; but scarcely anyone escapes feeling bewildered. None of the girls who were asked how they felt about addressing everybody by his or her Christian name, had been free from embarrassment in the beginning. One girl spoilt her whole career by addressing a forewoman as 'madam'. This conspicuous experience is followed by many more subtle ones. The girls have to learn the norms and rules of their new social sphere; the method of learning is imitation. As the girls are too young to distinguish between the important and the non-important, they imitate everything. To be kept an outsider is the only and very effective punishment for those who do not succeed quickly in the process of adjustment.

This imitation covers every possible shade of behaviour in the factory; it is made easy through the great number of living examples, and is made urgent through the menace of remaining an outsider. The most noticeable effect is the adjustment of the outer appearance after a couple of weeks. Lipstick, rouge, and powder are commonly used from the early morning onwards; waves and curls become obligatory. This is considered to be not only necessary for improving the appearance, but also as an expression for a certain 'savoir faire'. These and other small luxuries—the ration book holder, the gas mask cover, rings, ribbons, and so on—are not only enjoyable in themselves but they are part of the norm that has to be adopted. The greater their amount and variety, the higher is the social prestige of a girl. This standard is irrespective of the girl's economic situation, which varies enormously according to the number of members of the family in work.

It is equally important for the girl's prestige to have a 'young man'. To a certain extent his existence means a relief of the strain on the weekly budget of the factory girl. But to say so, or for that matter, to think so, would make a girl completely impossible. Perhaps in no other sphere of life is the behaviour of the factory girl more strictly regulated by her highest ideal, respectability, than in her relations to her boy friends. The social significance of marriage is still higher for the working class girl than for the middle class girl. The expectation of marrying at latest in her twenties is part and parcel of the outlook of a factory girl; she is very conscious of the fact that this is her only means of escape from the routine and monotony of work. The romantic notion of love is reserved for the engagement period. Before reaching this state the girls dream of romance, stimulated by films and fiction, but have matter-of-fact attitudes towards their boy friends. An extreme case of this matter-of-fact outlook was shown by a girl of eighteen who said: "I have four boy friends, one in the Navy, one in the Army, one in an ammunition factory in W., and one in this town. I think it is wise in these days to have more than one boy, one never knows what is going to happen to them."

Uniformity of outlook is further achieved in the literary taste of the girls, and their attitude towards current events. In this latter respect the terminology they use is borrowed from the headlines of the most frequently read newspaper, the *Daily Mirror*. The influence of wireless and newspaper headlines on the girls can hardly be over-estimated. It was noticed again and again that the girls repeated verbatim in their conversations phrases from the B.B.C. news bulletins or headlines from their papers, without being conscious of quoting somebody else's expressions.

The outstanding feature of this description is the tendency of the factory girl to conform to type and not to be conspicuously different from the others. This 'ideal type' of factory girl has, however, one quality to which a special group cannot conform; that is, age. The ideal type must be under thirty years of age. The girls above this limit who have not achieved marriage are faced with a serious conflict. The individual understands that being more than thirty years old, she has to pretend not to mind, to carry on hopefully, to keep up appearances and spirits. This she may manage for the next ten years or so; but from then on she finds it increasingly difficult. Her own family is normally dissolved, or at least is living on Old Age Pensions. The small luxuries can be maintained only by considerable effort, but they look more shabby and out of place. Every year carries them farther away from the 'ideal type', and makes it harder to maintain self-respect. They begin to wonder about the sense of life. One example may be quoted: "Sometimes I think my life has been a waste. You know what I would have liked to be: to be somebody of whom notice is taken. Sort of 'here she comes', people ought to say wherever I go. Then I would have felt that life has some sense. Often when I am in bed now in the evening I say to myself: if it weren't for my old parents, I wouldn't mind being dead."

The problem of the unmarried older woman exists, of course, in every social sphere. But it is especially difficult to solve for the factory girl who has lived under the pressure of a social atmosphere which has no room for old women. Such compensations for this type of disappointment as are afforded by life and work get fewer with increasing age. Those who are definitely old and have resigned themselves to that stage of life tend to be isolated in the factory. The years preceding such resignation are the most difficult and pathetic ones for the female industrial worker. As long as she can deceive the others, she can deceive herself; therefore an ever-increasing attention is paid to appearance. In this brave struggle not to give in, the knowledge of other people's troubles seems to be a great comfort. In no other age group was found so great an interest, and sense of tragedy, in life. To assume that social contacts outside the factory and hobbies of various kinds are an effective help at this stage, would be to make a mistake of such a kind as the assumption that the unemployed man can make good use of his enforced leisure time. When the vital needs of an individual are left unsatisfied, not much energy seems to remain for substituting compensations.

VI. SUMMARY

Three psychological problems of factory life have been discussed. These problems must necessarily exist in every factory; the special form described here concerns one factory only, and cannot yet be generalized.

(1) The social relationships in the horizontal dimension is 'equalitarian'; the vertical relationship between workers and foremen and headgirls is 'dictatorial'; the vertical relationship between the workers and the management is 'patriarchal', and also ambivalent.

(2) The predominant experience of the factory girl on repetitive work is boredom. Boredom and fatigue are experienced as entirely different phenomena. The time experience is chiefly dependent on the length of the uninterrupted working spell.

(3) The standards of value of school life are entirely different from those in the factory. The pressure of social norms in the factory is strong, and compels the girls to imitate each other. This imitation results in producing a type and hinders the development of individuality. The lack of equally strong sets of norms for the older woman in the factory makes her adjustment subjectively difficult, and prevents her from leading a normal life inside the factory atmosphere.

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THE INFLUENCE OF THE WILL TO SUCCEED ON THE PERFORMANCE IN GROUP-GIVEN MENTAL TESTS[1]

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I. INTRODUCTION

IN the *British Journal of Psychology* (1936, xxvii, 119–25), a list of suggestions for future investigations in the field of vocational guidance was submitted under the heading: "A programme of desirable investigations on the topic of vocational guidance." Among the subjects suggested for study, there appeared the following: "A study of the 'will-to-succeed' in group-given tests would be valuable" (p. 123). This study was carried out in an attempt to measure the influence of the 'will-to-succeed' on the performance in group-given mental tests.

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[1] Part of a thesis accepted for the M.Sc. degree of the University of South Africa.

II. OUTLINE OF THE INVESTIGATION

In this investigation a battery of tests, measuring a variety of functions, was drawn up. These tests, as well as an intelligence test, were then given to the subjects. On the basis of the intelligence test scores and on the basis of the scores obtained in these tests, the subjects were divided into two equal groups. One group, the non-incentive group, was now used as the control group, and was retested under the same conditions. To the other group, the incentive group, an incentive was given on the re-testing. The results obtained were statistically treated to find if the incentive influenced the performance.

III. SUBJECTS AND TESTS USED

(1) *Subjects*

The subjects in this investigation were students, mostly undergraduates of the Rhodes University College, Grahamstown, South Africa. About sixty-five students took these tests, all voluntarily, but as some missed some of the tests, the results of only fifty-six students could be used.

(2) *The tests*

The tests used were selected so as to measure a variety of functions, e.g. perceptual-motor functions, memory span, learning, etc. The tests were obtained from the selection used in the Psychology Laboratory of the Rhodes University College, and also from the works of Hull (5) and Whipple (9).

The following are the tests that were used:

Test I. Memory span for digits. In this test twenty-one series of digits were read out to the subjects, and after each series had been read, the subjects were required to reproduce the series. The digits were read in time with a silent metronome at the rate of about a digit per second. There were three series of four digits each, three series of five digits each, etc., up to three series of ten digits each. Care was taken to avoid combinations of digits which could result in any undue facilitation in the retention of the series of digits.

Test II. Memory of design (see Hull (5), pp. 326–8). In this test, a number of designs, such as those shown in Fig. 1, were drawn on a large card. This card was then exposed to the subjects for 30 sec., after which they were required to reproduce the designs.

Test III. Manual operations. This test was introduced in an attempt to measure a subject's eye and hand co-ordination. The material of the test consisted of rows of small circles—0's as made by a typewriter, e.g. 00000 00000 00000 00000. The 0's in the successive rows were arranged in groups of 5, 6, 7 and 8. The subjects were required to work along these rows and to place a pencil mark in each circle. The subjects had to work as fast as they could, and yet had to make sure of placing a mark in each circle. Two minutes were allowed for the test.

Test IV. Number series test. In this test, series of numbers in arithmetical and geometrical progression, or in a combination of these, were drawn up. In each series two numbers were left out and the subjects were required to fill in these omissions, e.g. 10 1 8 1 .. 1 4 ... Five minutes were allowed for the test.

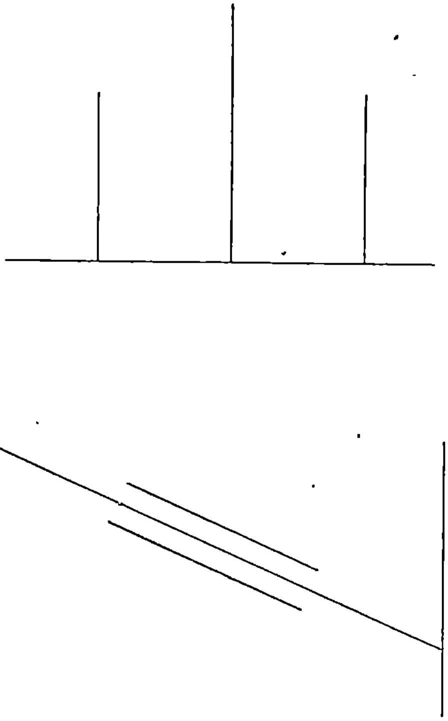

Fig. 1.

Test V. Instructions test (see Wild(10), p. 333). This test, as well as Test VI, were the same as those used by Wild. The material of this test was made up of twelve short paragraphs; e.g. "If the fourth word to the right of the second word in this sentence has more letters than the thirteenth word in the sentence, write 'less' here......." The execution of these instructions demanded the educing of certain relations. The marks for each paragraph were allotted on the basis of the difficulty and the number of major relation eductions involved in each problem.

Test VI. Cancellation test (see Wild(10), p. 334). The material for this test was made up of rows of letters typed in groups of four; e.g. hy~~ff~~ trgg yyrd dtt~~e~~ ~~e~~trf t~~ff~~g gyn~~d~~ ~~d~~eeg. The subjects were required to cross out pairs of letters, subject to certain stated conditions, viz. *pairs* of d's had to be crossed out when the next *pair* of letters was a pair of e's, a pair of e's had to be crossed out when the next pair of letters was a pair of f's, and a pair of f's had to be crossed out when the next pair of letters was a pair of g's. In scoring, deductions were made for omissions and faulty cancellations. The time limit was seven minutes.

Test VII. Filing test, an adaptation of test 6 (*b*) of the National Institute of Industrial Psychology—Clerical Tests—Series 25. In this test an alphabetical list of nonsense words was supplied. With this list there was also supplied a smaller list of nonsense words. The subjects were required to find where each word of the smaller list fitted alphabetically into the longer alphabetical list. On the retesting, for both incentive and non-incentive groups, the smaller list of words in the test was changed. This was done so as to eliminate any facilitation of the work in the retesting which could have resulted from the retention of spatial relations educed during the first test. The subjects were allowed three minutes for the test.

Test VIII. Digit symbol test (see Whipple(9), pp. 499–516, Substitution Test, Test B). In this test the numbers 1–9 were each supplied with a given symbol. Below these appeared two columns of numbers and the correct symbol had to be substituted for each digit in the number. The execution of this test is dependent upon the quickness of perception and the successful formation of associations. Four minutes were allowed for the test.

Test IX. Adding test. For this test, use was made of the Kraepelin's Adding Sheets. These sheets contain columns of digits and in our experiment these digits had to be added, four at a time, down the column. Ten minutes were allowed for the test.

IV. Administration of tests

(1) *Instructions.* Each subject was supplied with a set of nine tests fastened together.

The instructions for each test were printed on the separate test sheets, at the bottom of the previous test page, thus preventing any subjects from starting on a test before the instruction to start was given. In the case of tests VIII and IX, however, the instructions were given orally.

Before a testing was started, some general standardized instructions were given, and these were repeated exactly at subsequent testings. Before each individual test was started, the instructions for that test were read over with the class.

(2) *The first testing.* All the students were simply asked to do the tests, without any emphasis being placed on working hard or fast, etc. For convenience the subjects were taken in two groups, the respective groups being tested on two successive days. The test conditions were kept constant on the two successive days. All subjects were also given the National Institute of Industrial Psychology Intelligence Test, Series 33.

(3) *Division into equal groups.* On the basis of the scores obtained on the intelligence test and on the battery of nine tests, the subjects had now to be divided into two equal groups.

As the scores of the nine tests, as well as the scores on the intelligence test, had to be taken into account, it was obviously impossible to obtain two groups which were equal with respect to all the tests. Moreover, the fact that some of the subjects could only attend the tests on certain afternoons had also to be taken into consideration. Table I, however, shows that the two groups were roughly equal. In the table are shown the average scores obtained by the groups on the first testing. The one group was to be used as a non-incentive and the other as an incentive group.

Table I

	Non-incentive group		Incentive group	
Test	Average score	σ	Average score	σ
I	12·25	3·3	12·0	2·9
II	20·6	3·0	20·5	3·9
III	260·1	44·4	263·6	30·1
IV	22·6	7·7	24·5	9·6
V	20·4	6·9	20·8	8·5
VI	46·5	14·5	46·5	17·7
VII	14·0	4·0	14·3	3·6
VIII	133·5	18·4	138·2	24·2
IX	119·5	39·2	123·5	37·3
Intelligence test	146·5	18·0	149·7	15·6

(4) *Re-testing.* After the subjects had been divided into the two groups, both groups were re-tested. This was done about a month after the first testing and also on consecutive days. This ensured an approximately equal lapse of time between the two testings for all the subjects.

On the re-testing, the non-incentive group, which was used as the control group, repeated the tests under conditions identical with those under which the first testing was carried out. No indication was given to them at any time that the experiment was concerned with incentives, nor were they told that the other group would be given any special incentive. Further, the non-incentive group could not have been influenced by any discussion with the members of the incentive group, because the incentive group was re-tested after the non-incentive group.

For the incentive group the re-testing was done under the same conditions, except for the fact that an extra incentive, urging them to improve on their previous performances, was given.

(5) *The incentive used with the incentive group.* The incentives that are used in investigations of a comparable type are many and varied. Among the incentives commonly used may be mentioned the following: group and individual rivalry; praise and reproof; prizes (monetary or otherwise); personal appeal, etc.

Since we were interested in the "*will* to succeed", it was decided to find out what effect would be produced by an appeal to the incentive group to assist and co-operate in the investigation. When this group was re-tested, the aim of the research was explained to the subjects and they were asked to make a special attempt to improve on their previous performances and so to do better than the other group. (The rivalry motive was not, however, emphasized.) Moreover, the Head of the Psychology Department, Dr Wild, addressed the subjects and encouraged them to better their previous scores. This appeal was made very strongly, and was repeated at intervals between the tests. This kind of personal appeal is an incentive commonly met with in school, home and psychological test situations; and we wished to know what was the effect of such an incentive on performances of various kinds.

V. RESULTS

(1) *Reliability of tests*

Since the non-incentive group carried out the first testing and the re-testing under the same conditions, the coefficients of correlation for these two sets of scores should supply a measure of the reliability of the tests. Table II gives the coefficients of correlation and the probable errors obtained for the nine tests, using the formula

$$r=\frac{\Sigma\,(xy)}{N\sigma_x\sigma_y};\quad \text{P.E.}=\frac{0{\cdot}6745\,(1-r^2)}{\sqrt{N}}.$$

The coefficients of correlation are all fairly high. Though the number of cases used is rather small, viz. twenty-eight students in the non-incentive group, these tests may be regarded as reasonably reliable.

Table II

Test	Coefficient of correlation	Probable error
I	0·82	0·04
II	0·67	0·07
III	0·83	0·04
IV	0·83	0·04
V	0·78	0·05
VI	0·89	0·03
VII	0·79	0·05
VIII	0·95	0·01
IX	0 94	0·02

(2) *Variability of scores*

Investigations in this field have shown that the introduction of a strong incentive to the test situation very often influences the variability of the scores obtained. Thus Maller & Zubin (7) found a greater variability of scores under incentive conditions. Benton (1), however, found that both his groups gained somewhat in scores on the re-test, but that there was a small decrease in variability. Burns (4) again states that the effect of motivation on variability is not constant, but varies with the function studied.

Table III. *Standard deviations*

	Non-incentive group			Incentive group		
Test	First testing	Re-testing	% increase	First testing	Re-testing	% increase
I	3·3	3·8	+17·4	2·9	3·0	+ 5·2
II	3·0	2·7	− 9·0	3·9	3·0	−21·7
III	44·4	48·2	+ 8·5	30·1	42·9	+42·8
IV	7·7	10·0	+30·6	9·6	9·6	0
V	6·9	9·0	+30·8	8·5	7·8	− 8·6
VI	14·5	15 4	+ 6·4	17·7	19·3	+ 9·2
VII	4·0	3 3	−17·7	3 6	3·4	− 7·2
VIII	18·4	22·8	+23·8	24·2	21·0	−13·5
IX	39 2	46·5	+18·9	37·3	39·4	+ 5·6

Table III shows for the present investigation the standard deviations of the scores obtained in the first testing and the re-testing, and the percentage increases in the standard deviations in the re-testing, for both the incentive and the non-incentive groups.

An inspection of Table III shows that for the non-incentive group the variability, as shown by the standard deviations, increased in the re-testing as compared to the first testing in seven of the nine tests; whereas in the case of the incentive group, there was an increase in only four out of the nine cases. Further, the variability decreased in two cases (tests II and VII) for the non-incentive group, but in five cases (tests II, IV, V, VII and VIII) for the incentive group. These results thus suggest a decrease in variability under incentive conditions as compared to normal conditions.

(3) *Did the incentive influence performance?*

The effect of the introduction of an incentive on the performances in these tests was measured in the following way. Consider the results obtained for test I by the subjects of the non-incentive group. Two sets of scores were available, those of the first testing and those of the re-testing. The value of $\frac{M_2 - M_1}{\text{P.E.}_{M_2 - M_1}}$ was now calculated from these two sets of scores. If the value of $\frac{M_2 - M_1}{\text{P.E.}_{M_2 - M_1}}$ was found to be greater than 4, it was assumed that a significant difference existed between these two sets of scores. Similarly, it was found whether a significant difference existed between the scores obtained on the first testing and on the re-testing for test I in the incentive group. If no significant difference existed between the two sets of scores for test I of the non-incentive group, effects due to repetition could be discounted; so that if a significant difference was found between the two sets of scores for test I of the incentive group, it could be attributed to the extra incentive.

These calculations were made for each of the nine tests and for each of the two groups. The results are shown in Tables IV and V.

Table IV. *Non-incentive group*

	First testing		Re-testing			
Test	M_1	σ_1	M_2	σ_2	$M_2 - M_1$	$\frac{M_2 - M_1}{\text{P.E.}_{M_2 - M_1}}$
I	12·3	3·3	13·1	3·8	0·8	1·39
II	20·6	3·0	21·8	2·7	1·2	2·32
III	260·1	44·4	278·6	48·2	18·5	2·22
IV	22 6	7·7	26·8	10·0	4·2	2·62
V	20·4	6·9	27·9	9·0	7·5	5·21
VI	46·5	14·5	60·9	15·4	14·4	5·35
VII	14·0	4·0	13·5	3·3	−0·5	−0·76
VIII	133·5	18·4	137·9	22·8	4·4	1·18
IX	119·2	39·2	135·1	46·5	15·9	2·06

Table V. *Incentive group*

	First testing		Re-testing			
Test	M_1	σ_1	M_2	σ_2	$M_2 - M_1$	$\frac{M_2 - M_1}{\text{P.E.}_{M_2 - M_1}}$
I	12·0	2·9	13·8	3·0	1·8	3·40
II	20·5	3·9	21 8	3·0	1·3	2·08
III	263·6	30·1	278 0	42·9	14·4	2·16
IV	24·5	9·6	28·5	9·6	4·0	2·33
V	20·8	8·5	27·6	7·8	6·8	4·65
VI	46·5	17·7	61·9	19·3	15·4	4·63
VII	14·3	3·6	14·8	3·4	0·5	0·80
VIII	138·2	24·2	151·1	21·0	12·9	3·17
IX	123·5	37·3	145·8	39·4	22·3	3·24

An inspection of Tables IV and V shows that with one exception (test VII, non-incentive group) the repetition of these tests caused an increase in score under both normal and incentive conditions, but the increases were mostly small, and in only two cases, tests V and VI, were the increases large enough to show significant differences. For tests V and VI, however, although significant differences were found between the results of the first testing and the re-testing, these differences were found in the non-incentive group as well as in the incentive group. These increases can thus not be ascribed to the influence of the incentive, but were probably due to practice.

In the cases of tests I, VIII and IX a greater improvement was found on re-testing under incentive than on re-testing under non-incentive conditions, but the differences are not significant.

VI. CONCLUSION

In this study a set of nine tests was administered to fifty-six students. On the basis of their scores on these tests, and on an intelligence test, these subjects were divided into two equal groups which were then re-tested; one group under conditions identical with those under which the first testing was carried out, the other group under very strong incentive conditions.

It was found that the repetition of these tests caused an increase in scores under both normal and incentive conditions. In only two cases were the increases large enough to result in significant differences, and in no case did the incentive group show a significant increase in score over and above corresponding increases for the non-incentive group.

Thus we have not demonstrated any significant improvement in any of the tests due to the introduction of an incentive involving appeal, encouragement, suggestion and exhortation.

This may be due to the following causes:

(*a*) The ordinary conditions under which mental tests are performed are such as to stimulate the subjects into trying their hardest on the first testing.

(*b*) Improvement in re-tests may vary so much with individuals as to cancel out effects on the group as a whole. Thus Bradford (3) found that the amount of improvement in re-tests varies considerably among individuals. McKinney (8) discovered individual differences in the susceptibility of his subjects to his suggestion. Book & Norvell (2) conclude that "incentives influenced men more than women, the intelligent more than the average". Miss Hurlock (6) concludes that "older children respond more to both praise and reproof than do younger ones".

(*c*) Improvement in the re-tests may vary with the type of test. If this was the case, it would not be possible to generalize on the influence of incentives. Thus Maller & Zubin (7) obtained different results in their subtests. In some cases they found an increase on the re-test, in others a decrease. Burns (4) found that results vary with the function studied.

(*d*) The incentive used may in fact not be strong enough to produce any improvement in performance.

If, now, the above considerations are valid, then the influence of incentives on the performance in mental tests seems to be dependent on

(*a*) The individual subject.
(*b*) The type of test.
(*c*) The strength of the incentive.

Hence, any extensive investigation directed to measuring the influence of incentives should take account of individual differences, of different ages, and use a great variety of tests and a great variety of incentives, if the problem of the influence of incentives is to be adequately dealt with.

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A RESEARCH IN COLOUR PREJUDICE

By S. P. ADINARAYANIAH

From the Psychological Laboratory, University College, London

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I. INTRODUCTION

COLOUR prejudice is an important factor operative in the social relations of the peoples of many countries, and as such demands the careful attention of the social psychologist. It has been a perennial problem in the United States of America and in British South Africa. Though not so acute in India, it has been and still is a source of much misunderstanding and friction between the British and the Indians. The problem exists in one form or the other in many parts of the world to-day. Though a good deal of speculative and descriptive work has been done on the origin and nature of colour prejudice, up till now very few psychological studies have been attempted—especially studies which employ a quantitative technique. Yet it is a matter well within the purview of experimental social psychology. Such studies as at present exist are mainly confined to America, the outstanding exceptions being the work of Lapiere (7) and Macrone (2).

An important step in the isolation of the prejudice factor and its quantitative study was taken by Bogardus (1), when he perfected the technique of his Social Distance test. This was one of the earliest attempts at a scaling device for attitude measurement and has been since widely used both by its author and several other investigators. Bogardus himself has used his test extensively to study, among other things, the attitude of southern Whites towards the Negroes and that of those in the south-west to Mexicans. Macrone (2) used it to test the attitude of the

European settlers in South Africa towards the African population. Among other recent attempts to measure Social Distance, the work of Dodd (3) and Masuka (4) deserve mention. The former had 1700 freshmen of the Beyrut University as his subjects and the latter conducted his research in that Mecca of students of race psychology—Hawaii.

Thurstone's (5) Method of Paired Comparisons is on an equal footing to that of Bogardus's Social Distance test from the point of view of technique for the measurement of attitudes. The method is an extension into the field of social psychology of the familiar principle underlying the Weber-Fechner Law. It is based on the assumption that one can judge the difference between two stated opinions with as much consistency and accuracy as between two specific weights. Thurstone and Chave have also used a rating technique based on the psycho-physical method of equal-appearing intervals. The Thurstone scale has been widely used in the United States and the results obtained have been similar to those obtained from the Social Distance test. Guilford (6) has studied the racial preferences of 1000 students in the various American universities by using the Thurstone technique.

Lapiere (7) has made an interesting comparative study of race prejudice in England and France. He used no questionnaire, test or scale of any kind but employed the simple device of introducing, as unobtrusively as possible during the course of conversation, the question "Would you let a good-Negro live at your house?" Horwitz (8) has studied the development of attitude towards the Negro, using as his subjects pupils from the schools of New York and the South from the kindergarten to the eighth grade. Campbell & Stover (9), Droba (10), Chen (11) and F. T. Smith (12) have all made interesting studies in the experimental modification of the racial attitude, the subjects in all the cases being American.

II. AIM OF THE PRESENT RESEARCH

England with its wide colonial connexions in the East and its cosmopolitan metropolis affords unequalled opportunities for research to the student of racial attitudes. Yet very few have taken advantage of this fact. One of the main objects of the present research was to get some idea of the racial attitudes of the English, especially the residents of London. Bogardus's Social Distance test was employed for this purpose. As far as the present investigator knows, this test has never been used in England before.

Several investigators (Howells and Moore, among others, to whose work Murphy (13) makes reference) have hinted at the possibility of a relationship between personality and social attitudes. For example, extreme liberalism and introversion or colour prejudice and conservatism, broadly speaking, may go together. Another object of the present investigation was to find out how far colour prejudice accompanied a particular type of personality as exemplified by the concepts of Introversion and Extroversion, and how far it was related to the social attitudes roughly described as Liberalism and Conservatism. An attempt has been made to inter-correlate Liberalism and Conservatism as measured by the Vetter test (14), colour prejudice as measured by Bogardus's Social Distance test and Introversion and Extroversion as measured by Freyd's inventory (15).

Lastly, the investigation aimed at making a comparative study of colour prejudice in England and France. Popular opinion recognizes a marked contrast between the attitudes of these two nations. Lapiere's study seems to confirm such a view. As a basis of comparison, fifty British and thirty French students were given the Social Distance test.

III. THE QUESTIONNAIRES

Three questionnaires were used in the present research:

(1) *Vetter's Attitude scale.* Vetter's scale consists of a set of thirty-six topics covering the following groups of opinions: (i) political, (ii) social, (iii) individual freedom, (iv) economic, (v) authority of religion and national tradition, (vi) international, (vii) inter-racial.

Under each topic a list of five graded opinions were given, ranging from radical to reactionary, and the subjects were required to choose the opinion that came nearest to their view. The test thus offered a convenient method of grading the subjects into radical, liberal, neutral, conservative and reactionary. As the scale was primarily intended for America, it had to be modified to suit conditions in Great Britain. In its modified form it consists of thirty topics, of which one is given below as an example:

In each of the sets of five opinions given below draw a circle around the number of the opinion with which you are most in sympathy (whether or not it expresses your *exact* view).

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[1] These were backed up by a personal interview and another questionnaire for acquiring qualitative data. Full details of these are given in my thesis (16).

(1) *Government Ownership.*

1. Governments should be prevented, as far as possible, from acquiring ownership or control of any lands, properties, industries or companies.

2. Only such enterprises as cannot be made to yield a profit under private ownership and are necessary to the nation should be under government ownership or control, such as young forests, parks, canals or posts and telegraphs.

3. Governments should be allowed to compete freely with private industries in the field of public utilities, such as water supplies, gas, electricity and transportation systems.

4. Governments should own and control all raw materials, and public utilities and such industries as in the nature of things tend to become monopolies.

5. Governments should own, operate and control practically the entire economic resources of the land.

Radical, liberal, neutral, conservative and reactionary opinions were awarded 5, 4, 3, 2, and 1 marks respectively. As some subjects did not mark certain topics, averages and not total marks were taken into consideration. Thus the highest possible average was 5 and the lowest 1. Averages were calculated to two decimal places.

(2) *Bogardus's Social Distance test.* The test consists of a series of seven questions about the subject's attitude towards a particular nation (there being a list of several nationalities). In each question five degrees of choice were offered—*any, most, some, few* and *none.* Macrone's version of the test as used for South Africa was employed, though the nationalities selected necessarily differed from his. The following ten nationalities or races were chosen: Canadians, Turks, Germans, Chinese, Americans, Red Indians, French, Indians, Italians and Negroes (five oriental and five occidental). A section from the readapted form of the test is given below as an example:

Underline the word which expresses, or most nearly expresses, the way you feel towards the members of other groups, nationalities, or races (as a class, and not the best members you have known, nor the worst) with regard to certain relationships stated below.

1. According to my first feeling reaction, I would willingly admit:

(*a*) Any: Most: Some: Few: No—Canadians as visitors to my country.

(*b*) Any: Most: Some: Few: No—Canadians to live and work in my country.

(*c*) Any: Most: Some: Few: No—Canadians to full citizenship, including the right to vote in my country.

(*d*) Any: Most: Some: Few: No—Canadians to my school or university, to profession or occupation.

(*e*) Any: Most: Some: Few: No—Canadians to my club.

(*f*) Any: Most: Some: Few: No—Canadians to my home as my personal friends.

(*g*) Any: Most: Some: Few: No—Canadians to close kinship by marriage.

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The following scheme of marking used by Macrone was employed:

	Any	Most	Some	Few	No
As visitors	+ 2	+1	0	−7	−14
To live and work	+ 4	+2	0	−6	−12
To full citizenship	+ 6	+3	0	−5	−10
To school, university, etc.	+ 8	+4	0	−4	− 8
To one's club	+10	+5	0	−3	− 6
To one's home	+12	+6	0	−2	− 4
To close kinship by marriage	+14	+7	0	−1	− 2

Thus the number of marks varied according to the nature and degree of the statement endorsed. For example, willingness to have any members of a nationality as visitors received only +2 marks, as this does not involve a great amount of racial friendship, whereas unwillingness to admit any members received a large minus mark (−14), as this indicates the presence of definite racial hostility. The highest possible score was +56, indicating a high degree of racial tolerance, and the lowest possible score was −56, indicating marked race prejudice.

(3) *Freyd's Introversion-Extroversion test.* Freyd's list of introvert traits, converted into questions by S. Brahmacharya (17), was used. A few questions are given below as examples:

1. Do you limit your acquaintance to a select few?
2. Do you feel hurt readily?
3. Are you sensitive about remarks or actions which have reference to yourself?
4. Are you suspicious of the motives of others?
5. Do you worry over possible misfortunes?

Marks were based on a self-rating scale and the subjects were given the following instructions:

Put 5 if you have the trait *very much* in you.
Put 4 if you have the trait *much* in you.
Put 3 if you have the trait *moderately* in you.
Put 2 if you have the trait *a little* in you.
Put 1 if you have the trait *little* in you.
Put 0 if you *do not have* the trait at all.

As all the questions dealt with introvert traits, a high mark in this test was taken to indicate an introvert type of personality and a low mark the reverse. The highest possible marks were 355 and the lowest 0.

The results of these three tests thus provided a set of three scores, giving an indication of the subjects' radical-conservative, introvert-extrovert tendencies and their racial attitudes. Correlations were worked out on the basis of these scores. As four of the five oriental races given in the Social Distance test were so-called 'coloured races', the result of this test also served as a valuable index to the existence or otherwise of colour prejudice among the subjects.

The French version. In order to make a comparative study of the racial attitudes of British and French students, the Social Distance test was translated into French and given to French students, some resident in London and others in Paris.

IV. THE SUBJECTS

Three hundred mimeographed copies of these tests bound into booklets were distributed to British people, over 17 years of age, mainly resident in London. Of these, 175 copies were returned, completely filled up.

The subjects were almost equally divided as to sex, and ranged in age from 18 to 70. They included, besides fifty students, people of varied professions—accountants, bank officials, civil servants, clergymen, teachers, nurses, typists, etc.

Eighty copies of the French version were distributed, of which thirty were returned. The French subjects were all students above 17 years of age, and included almost equal numbers of each sex.

The reception to the questionnaires was uniformly good. Most of the people approached showed a great interest in the project and often asked for more copies to distribute among their friends. These offers of co-operation were fully utilized, as by this means the identity of the investigator was kept in the background. As he was an Indian, it was felt that if his identity were known, considerations of politeness might prevent the subjects from being as frank as they otherwise would. 109 of the copies thus indirectly distributed were returned.

V. RESULTS

The results of the inquiry are summarized in the following tables:

Table I. *Showing the average score for each nation in Bogardus's Social Distance test (British version)*

No.	Nationality	Score
1	Canadians	+24·5
2	Turks	− 3·7
3	Germans	+ 9·0
4	Chinese	− 1·6
5	Americans	+18·6
6	Red Indians	− 3·6
7	French	+16·4
8	Indians	+ 4·4
9	Italians	+ 3·3
10	Negroes	− 4·2

Table I gives the average marks for each nationality in this test. The Turks are the only ones amongst the six 'white' races to get a minus score, and the Indians the only ones amongst the four 'coloured' races to get a plus score. That the latter are ranked above the Italians forms an interesting commentary on the influence of political factors on racial outlook. Canadians seem to be the most popular and Negroes the least.

Table II. *Showing the correlation between the total scores for Vetter's Radicalism-Conservatism test, Bogardus's Social Distance test and Freyd's Introversion-Extroversion test*

No.	Traits correlated	r	P.E.
1	Social Distance and Radicalism-Conservatism	+0·516	0·037
2	Social Distance and Introversion-Extroversion	+0·096	0·05
3	Introversion-Extroversion and Radicalism-Conservatism	+0·078	0·05

Table II gives the inter-correlation of the three tests used in the present inquiry. It reveals the important fact of a positive correlation of +0·516 between the prejudice score as revealed by the Social Distance test and the Radicalism-Conservatism score as revealed by Vetter's test, with a probable error small enough to be negligible. The amount of correlation between Social Distance and Introversion-Extroversion as well as that between Introversion-Extroversion and Radicalism and Conservatism seems to be insignificant.

Table III. *Showing the average score for each nation in Bogardus's Social Distance test (French version)*

No.	Nationality	Score
1	Canadians	+22·3
2	Turks	− 4·6
3	Germans	+ 4·2
4	Chinese	− 4·9
5	Americans	+15·6
6	Red Indians	+ 3·8
7	English	+22·8
8	Indian	+ 4·3
9	Italians	− 0·4
10	Negroes	− 4·4

Table III gives the average score for each nationality in the French version of the Social Distance test. The order of popularity of the ten nations listed in the test is not quite the same here as that of the British version. The English replace the Canadians as the most popular nation in France and Chinese replace Negroes as the least popular. Two striking similarities between the British and French scores are: (1) Indians are the only coloured race to get a + mark in both, and (2) Turks are the only white race to get a − mark in both.

Table IV. *Showing a comparative statement of the average marks for the ten nationalities in Bogardus's Social Distance test for British subjects other than students, British students and French students*

No.	Nationality	British subjects other than students	British students	French students
1	Canadians	+21·2	+32 8	+22·3
2	Turks	− 8·6	+ 8·8	− 4·6
3	Germans	+ 4·8	+17·7	+ 4·2
4	Chinese	− 6·5	+10·7	− 4·9
5	Americans	+14·1	+29·9	+15·6
6	Red Indians	− 9·7	+11·6	+ 3·8
7	French	+ 9·9	+22·7	—
8	Indians	− 0·1	+15·7	+ 4·3
9	Italians	− 1·4	+14·1	− 0·4
10	Negroes	− 9 6	+ 9·5	− 4 4
7	English	—	—	+22·8

When the scores of the fifty British students were separated from the total scores of the British subjects, the average marks of the remaining seventy-five non-student British subjects showed striking changes. The prejudice scores for Turks, Chinese, Red Indians and Negroes went up and Indians now got a small minus mark instead of their previous plus mark. In Table IV, the column for British students at once catches the eye both for its high scores and for the entire absence of negative values. A comparison of the marks of the non-student British subjects and the French students reveals the fact that the prejudice score for Turks, Chinese, Red Indians, Indians and Negroes is decidedly smaller in the case of the French.

Table V. *Showing the difference in the average marks of the British and French students in Bogardus's Social Distance test and its reliability*

Average score for British students	+176
Average score for French students	+ 63
Difference	+113
P.E. for British students	21
P.E. for French students	29
P.E. (diff.)	35·6
$\frac{\text{Difference}}{\text{P.E. (diff.)}}$	3·2

Table V shows that the average for the British students is very much higher than that for the French students, as revealed by the difference of +113 in favour of the former. The probable error of this difference is very low, 35·6 (slightly more than three times the difference); hence the difference has a high reliability value.

VI. CONCLUSIONS

The research produced a mass of interesting data and at least two conclusions of major importance. These conclusions are based upon (1) the positive correlation between Social Distance and Radicalism-

Conservatism, and (2) the scores of the French students in the Social Distance test.

Bogardus himself defines Social Distance as "the grades and degrees of understanding and intimacy which characterize pre-social and social relations generally". Negative scores in the Social Distance test would therefore indicate poor understanding and intimacy as regards the races concerned and thus reveal the presence of the prejudice factor. Since among the ten nationalities given in our version of this test, five belong to the 'coloured group',[1] we may look upon our score as a fair indication of the amount of our subjects' colour prejudice. An actual examination of the scores themselves reveals this clearly, since with the exception of Indians none in this coloured group get marks higher than any of the white group. Accordingly, the correlation of colour prejudice as revealed by the Social Distance test with Radicalism-Conservatism as revealed by Vetter's test, is in the opinion of the present investigator a finding of some importance. True that this correlation is nothing but a confirmation of the popular view that associates conservatism with 'clan-feeling' and liberalism with that larger outlook on life so necessary for racial tolerance. But even this confirmation of the popular view is not without its importance, having been achieved under such standardized conditions as those adopted in the present investigation and with such a representative sample of the public as we have had. Besides, independent of the popular view, the result has an intrinsic value of its own. For there is nothing inherently absurd in the combination of a conservative political or social philosophy and ideas of inter-racial friendship. Moreover, colour prejudice being by its very nature irrational need not be the concomitant of such reasoned-out systems of thought and outlook as those indicated by the terms liberalism and conservatism. Hence the finding of such a correlation was by no means a foregone conclusion (Tables I and II).

The poor correlation between colour prejudice and Introversion is not surprising, though its value as a negative finding is of some importance. The same applies to the poor correlation between Radicalism-Conservatism and Introversion.

An examination of the scores of the group of 175 British subjects who did the Social Distance test seems to establish with a fair amount of certainty the existence of a prejudice factor, since four out of the five nationalities in the coloured group get minus scores. The exception is Indians, who get a plus mark, and this may be taken as evidence of the fact that in the coloured group Indians are the most favoured, the positive score indicating even an anti-prejudice tendency. The ranking of Indians above Italians seems to suggest that as far as race prejudice is concerned, other factors besides colour often play an important part (Table I).

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[1] Throughout this section, for the lack of a better descriptive label, the phrase 'coloured group' is used to indicate Turks, Chinese, Red Indians, Indians and Negroes.

When the scores of the fifty British students were separated from the total, that of the remaining 125 British subjects showed many significant changes. There was an all-round increase in the prejudice scores and Indians, who previously had a plus mark, now get a small minus mark. There was thus now evidence of definite prejudice tendencies existing towards all coloured people, as far as the non-student British public was concerned, though this seems to be least operative towards Indians (Table IV).

Considering next the score of the fifty British students, we find that they contain no negative values and are uniformly high. Comparing their marks with those of the non-student part of our subjects, we are forced to conclude that there is a marked difference between the racial attitude of the British students and the British general public, and that in the case of the former colour seems to play little part (Table IV).

The results of the French group of thirty students who took the Social Distance test compared with the British group furnish us with one of the most striking conclusions of the present inquiry. Comparing their averages for the five coloured nations with those of the general British group of 175 subjects, we find very little evidence to support the popular view that colour prejudice is relatively far less in France than in England. Red Indians are the only nationality in the coloured group who get a positive score in the French version and a negative score in the British version. The prejudice score for the Turks and Chinese is higher among the French than among the British, and as regards Indians and Negroes the marks are almost identical in both groups. Our scepticism regarding the validity of the popular belief in this matter is further heightened by the enormous difference between the averages of the British students and the French students. Whereas none of the five coloured races get a negative score in the British student group, Negroes, Chinese and Turks do in the French group, and in some instances the difference in the scores is strikingly high in favour of the British group. We get however a confirmation of the popular view when we compare the French scores with the non-student British scores. The French prejudice scores are less than the non-student British ones in the case of Turks, Chinese and Negroes, while the Red Indians and Indians get a positive score among the French and a negative score among the British. Taking all these facts into consideration the present investigator feels justified in concluding that whereas colour prejudice is less among the French students than among the general British public, it is undoubtedly much greater among them than among British students (Tables I, III and IV).

Not only public opinion but an investigator of such repute as Lapiere has credited the French with far less colour prejudice than the British. In his investigation of colour prejudice in England and France, he had as his subjects 315 British and 440 French. His figures give a striking confirmation of his contention regarding the relative lack of colour prejudice in France. Our figures seem to suggest a contrary conclusion, in some respects at least. However, it must be remembered that Lapiere was dealing with a much larger number of subjects both in France and in England, and in the case of the French, a far more representative group than ours. Besides, his method of introducing, casually during the course of a conversation, a question relevant to colour prejudice is quite different from the method of rating adopted in the present inquiry. Nevertheless, even when due regard is paid to all these facts, the difference between the results of the two investigations is far too striking to be passed over as entirely insignificant.

A comparison of the average scores for the five coloured races, for the British non-student group, the British student group and the French student group brings into view many interesting possibilities of further research. Does the British student become less idealistic and more prejudiced as he leaves the sheltered academic atmosphere of the university and enters the wider arena of life, as our figures seem to suggest? Does the French student become more broad-minded and less prejudiced as he ceases to be less of a student and more of a citizen, as a comparison of Lapiere's and our figures seem to suggest?

Our chief conclusions may be summarized thus:

1. That there seems to be a relation between the Liberal and Conservative attitude and the attitude of colour prejudice.

2. That no such relation exists between Introversion and colour prejudice, or Introversion and the Liberal and Conservative attitude.

3. That colour prejudice is less among the French students than among the British non-student public, but decidedly higher than the British students.

4. That there are differences within our subjects' attitude to the

coloured group—Indians being the nation against whom there is least prejudice.

In view of the small number of his subjects and the limitations of the methods of measurement used, the present investigator does not claim for these results any more importance than that of 'pointers'—pointing the way to further research, which is bound to throw a good deal of light on a problem of paramount importance not only to students of Psychology but to humanity at large.

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An Indian student conducting a social inquiry of the nature contemplated in the present research is necessarily at the mercy of his public. To my subjects and all friends in England and France who helped me in the distribution and collection of my questionnaire I wish to express my grateful thanks. The research owes much to the valuable guidance and helpful criticisms of Prof. J. C. Flugel, under whom I had the privilege of working in the University College, London.

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ON A PECULIARITY OF RECOGNITION IN THREE CASES OF KORSAKOW'S PSYCHOSIS

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I. *Introduction* (pp. 230–231).
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III. *Material for first test of recognition* (pp. 233–234).
IV. *Results of first test of recognition* (pp. 234–240).
V. *Results with other types of material* (pp. 241–245).
VI. *Discussion* (pp. 245–248).
VII. *Summary* (p. 248).
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I. INTRODUCTION

THE object of this paper is to describe a variety of paramnesia recently observed in three cases of Korsakow's psychosis. Our attention was first called to the phenomenon in the course of a routine test of recognition, but it soon became clear that the paramnesia might express itself equally under the conditions of ordinary life. It therefore seems possible that we have uncovered an interesting and hitherto unrecognized concomitant of the amnesic syndrome.

The phenomenon may best be described as a variety of *reduplicative paramnesia.* It is not, however, by any means identical with the experience described many years ago by Pick (3) under this name. In the first place, it does not involve the projection of a series of actual experiences into the past. And in the second place, it lacks the quality of *déjà vu.* The essence of our phenomenon lies in *a failure to respond to identity*. Perceptual situations are treated *as in some manner changed* under conditions in which no objective changes of any kind have been introduced. Thus the patient is constantly unable to effect a judgement of identity in response to an unchanged situation. Many of his difficulties in adjustment to a constant environment can probably be traced to this deficiency.

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It is too early as yet to draw any conclusions as to the possible diagnostic value of our observations. It will be necessary to repeat the tests with other Korsakow cases and at different phases of the psychosis. Control experiments will also be required, and are already in progress. So far, these have failed to reveal the presence of this paramnesia in several cases of senile dementia. But the evidence is still far from conclusive.

We shall endeavour in this paper to give some illustrations of the paramnesia and of the conditions calling it forth in three cases of an alcoholic Korsakow psychosis. This will be followed by a tentative discussion of its nature and possible origin. We may, however, preface these observations by a brief account of the three cases studied.

II. CASES[1]

Case A. Age 55 years. Male. Unmarried. Agricultural labourer.

The patient was admitted to a Cambridgeshire hospital in October 1939, and later transferred to the Cambridgeshire Mental Hospital, Fulbourn. He was under our observation from 10. xi. 39 to 13. iii. 40. The onset of the psychosis was sudden, and took the usual form of an acute alcoholic delirium. On his admission to Fulbourn, however, he presented a typical amnesic syndrome. There was an outspoken retrograde amnesia covering a period of at least fifteen years, which provoked a well-defined situational disorientation. There was further a remarkably complete anterograde amnesia. Indeed, the patient's memory for the period of the illness was virtually non-existent. Confabulation, however, was not strongly in evidence at any stage. In his thinking, the patient showed many illustrations of the apposition of irreconcilable propositions. He displayed the typical apathy of the Korsakow psychosis.

There was no essential change in this patient's mental condition throughout the period of observation. A measure of behavioural orientation was gradually re-established, but there was never true recognition of his surroundings or of those around him. The patient had a measure of insight into his memory deficiency, but was by no means cognizant of its full gravity. He was very prone to rationalization of an evasive character.

This patient had been an agricultural labourer for the greater part of his life. His educational status was low and his intelligence limited. He had seen service in France, and for a time his orientation was dominated by his war experiences. The anamnesis provided unequivocal evidence of chronic alcoholism.

The diagnosis was *alcoholic Korsakow psychosis, with peripheral neuritis.*

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Case B. Age 55 years. Female. Unmarried.

The patient was admitted to St John's Hospital, St John's Hill, on 6. vi. 39 and transferred to St Ebba's Hospital, Epsom, on 13. vi. 39, where she later came under our observation. On admission to St Ebba's, she was confused, bewildered and lost. Her memory was grossly impaired and she confabulated freely. The patient made frequent mistakes of identity and was disoriented both for time and place. She was in poor physical health, with peripheral neuritis in both legs.

A certain improvement in the patient's mental state could be observed after about six months in hospital. Her confabulations became much less spontaneous, and by the middle of January 1940, she was approximately oriented in all spheres. She also began to show some insight into her intellectual deficiencies.

The patient was under our observation from 27. ii. 40 to 7. vi. 40. She was throughout this period tolerably well oriented and confabulated only in response to highly suggestive remarks. She also displayed considerable insight into her amnesia. Immediate memory was good, but retention in general remained gravely impaired. There was further a diffuse retrograde amnesia extending over some fifteen or twenty years.

The case history was unfortunately very incomplete. It appeared that the patient had received a fair general education and had later worked for many years as a stenographer. She had artistic and literary tastes and a fair acquaintance with English literature. By temperament, she was very reserved and somewhat suspicious of the intentions of others.

The diagnosis was an *alcoholic Korsakow psychosis.*

Case C. Age 57 years. Female. Housewife.

This patient was admitted to St Alfege's Hospital, Greenwich, on 20. ii. 40, and transferred to St Ebba's Hospital, Epsom, on 5. iv. 40. She came under our observation between 25. iv. 40 and 7. vi. 40.

On admission to St Alfege's, the patient displayed a profound memory loss, and was disoriented and hallucinated, believing that there were monkeys in the ward. By 28. iii. 40, the amnesia was already less marked, and autopsychic orientation largely restored. On admission to St Ebba's, however, she was found to remain disoriented for time and place and fabricated freely. But she denied hallucinations. The tendency to confabulate abated rather rapidly, and by the time the patient came under our observation she no longer confabulated even under provocation. On the other hand, a fluctuating situational disorientation remained, together with a diffuse and generalized retrograde amnesia. Affect was decidedly labile and there was little insight. Immediate memory and the recall of quite recent events was surprisingly good.

This patient had received comparatively little education, but liked reading and could do simple accounts. She was happily married and had a family of grown-up children. The present illness apparently set in about four months previous to her admission to hospital, when she began to get worried about her younger son, who was of military age, and the possibility of air raids. Unequivocal evidence of alcoholism could not be obtained, but all the symptoms pointed towards an alcoholic aetiology.

The diagnosis was *Korsakow's psychosis with polyneuritis, almost certainly of alcoholic origin.*

It is advisable to give a brief indication of the extent of recognition defect present in each of the three cases during the period of observation:

Case A. This patient displayed by far the most pronounced anterograde amnesia, which affected recognition quite as markedly as recall. His 'memory span' appeared to be limited to 15–60 sec., and he consistently failed on simple tests of recognition in which the time intervals exceeded 1 min. He invariabily failed to recognize the examiner on the successive interviews, some of which were separated by an interval of only one day.

Case B. Here the amnesia was less severe, and the patient was able to recognize the examiner on all interviews after the first. She gave good results on tests of immediate reproduction, and was sometimes able to recall very recent events with a very fair degree of accuracy. The temporal reference of these events was, however, extraordinarily poor. Her performance in tests of recognition will be indicated below.

Case C. This patient showed the least impairment of memory. Tests of immediate recognition and recall were executed satisfactorily, and recent events could be recalled fairly readily and with accurate localization in time. The examiner was invariably recognized without the least hesitation.

III. MATERIAL FOR FIRST TEST OF RECOGNITION

The paramnesia appeared consistently in all three patients and with all types of visual material. We may, however, select for our principal illustrations the responses of the patients to a set of six coloured postcards, chosen for their possible appeal to the interests of the patients. The six cards are described below. Of these, P 1, P 2 and P 3 were given first, in succession, and each exposed for 20–40 sec. Half a minute after the removal of P 3, the three cards were shuffled up with three new cards, R 2, R 4 and R 5, and the whole series again exposed in a similar fashion. The order of presentation was uniformly R 1 (P 3), R 2, R 3 (P 1), R 4, R 5, R 6 (P 2). The recognition test was repeated in whole or in part on the same or a subsequent session.

P 1 (*R* 3). A scene in the bar of a public house. The barman and two customers. The former is young, clean-shaven, and is in his shirt-sleeves. He has on a blue striped shirt, a red tie, and a yellow pullover with a red border. The right-hand customer is middle-aged and extremely corpulent. He wears a black bowler hat, blue coat and trousers, red waistcoat, yellow tie, and brown boots. In his right hand he holds a paper and in his left a pipe. He is leaning against the bar, facing to the right, and there is a large glass of beer on the counter beside him. There is a brown bag on the floor by his right foot. The second customer is also lounging against the bar and faces the first. He wears a brown check suit and cap, a green waistcoat and a blue tie. He is smoking a cigarette. There is a small glass beside him on the bar. In the background are shelves laden with bottles.

P 2 (*R* 6). A bench in the country. A young man, dark and rather handsome, sits on the bench with a young lady on his knee. He is in prominent blue R.A.F. uniform. The girl, also dark, is wearing a red dress. She strokes the man's face and he is holding her right arm. Her left arm rests on her lap.

P 3 (*R* 1). A Labour Corps unit at work. On the left, a low wall of sandbags, behind which are two soldiers in khaki. One of these has a spade over his shoulder. In the centre is a tall soldier in khaki uniform and a tin helmet. He carries a spade over his right shoulder and five sandbags on his head. On the right another soldier, probably an officer, who is expressing amazement at the spectacle and is literally 'falling over backwards' in his astonishment. In the background fields and trees.

R 2. A soldier in khaki chasing a girl, also in khaki, across a field.

R 4. Another scene in a public house. A barmaid and two customers. This card bears no obvious similarity to *P* 1.

R 5. Two female inebriates in a public house. A notice bearing the words 'Fine Old Gin' is prominently displayed above the bar. An irate barman is depicted on the right-hand side of the picture. There is no obvious similarity to *P* 1 or to *R* 4.

The instructions varied slightly on the different exposures. In general, the patient was first asked to note each card carefully, so that he would know it if he should see it later on. On the re-presentation, he was asked whether he had seen the card before, or whether it was the first or the second occasion on which the card had been shown. Further questions were often given, whose nature will be clear from the illustrations given below.

Supplementary tests with other types of material were also carried out. These are described in the text.

IV. RESULTS OF FIRST TEST OF RECOGNITION

Case A. 2. ii. 40. The three cards were shown as described above. The patient examined each one carefully, and commented appropriately enough on the content. The immediate recognition test gave the following results:

R 1 (*P* 3). *Look here, have you seen anything like this before?* No sir. *Not this afternoon?* No sir. *Sure?* Yes sir.

R 2. No. *Sure?* Yes. *Have you seen anything like it?* No sir. Not a man running after a woman.

R 3 (*P* 1). *Have I shown that to you before?* No sir. *Sure?* Yes sir. *Have you seen anything like it?* Yes sir, but that's not the one I saw before. *What was the other one like?* There was a dog on the floor, wasn't there? *Apart from the dog, was it the same?* The dog layed against the man—to the best of my recollections. *Was the man the same?* He was dressed different to this man. This is a different dress. *What had the other man got on?* A natural suit, more like you've got on. *Have you seen a picture of a bar like this?* I saw a bar, but it wasn't like that. *Have you seen this card before?* I saw something like it, but it wasn't that card.

R 4. No sir. *Sure?* Yes sir, I haven't seen that before. *Seen anything like it before?* No sir, I don't remember seeing anything like it. *Have you seen a bar like it?* I've seen a bar, but not like that.

R 5. *Have I shown that to you this afternoon?* No sir. *Is this the first or second time you've seen this?* First time...'Fine Old Gin'—I'd have known it if I'd seen that before....

R 6 (*P* 2). *Have you seen this before? Is this the first or the second time that you've seen this?* First time to my knowledge. *Seen anything like it before?* Yes, I see something like it, but this isn't the same card. *What was the other one like?* Man and young lady. That's all I noticed.

It will be seen that the three new cards are unhesitatingly rejected: there is no case of the acceptance of any of the new material as old. Of the three original cards, one is likewise rejected, but the remaining two elicit paramnesias of the type described above. In both cases, the card is rejected, but the patient confidently asserts that he has seen another card somewhat similar to it. The latter, however, is said to differ from the original card in certain important respects.

Certain of the cards were again shown immediately afterwards. We may quote the responses to *P* 1 and *P* 2:

R 3 (*P* 1). If I haven't seen this one, I've seen one like it. No. I don't think I've seen this one before—I should have noticed his red waistcoat. *Seen one like it?* All I noticed was a bar and some bottles....

R 3 (*P* 1) (*two minutes later*). *Have you seen this before?* No sir. *Seen anything like it?* Yes sir, something like it. I never noticed the man had a pipe in his hand. *Was it the same man?* It looks a bit like the same man. But I never noticed the red waistcoat, nor his pipe in his hand.... (*Card is taken away, shuffled with the others, and again given.*) *Is that familiar to you?* That's more like the one I saw. But I don't think I saw that one. I never noticed the glass of beer standing there.

R 6 (*P* 2). *Have you seen this one before?* No sir. I never noticed a gent. in a blue suit.

R 6 (*P* 2) (*one minute later*). *Now is this familiar to you?* I saw a gent. with a blue suit, but I haven't seen this one.

R 6 (*P* 2) (*two minues later*). No sir. *Sure?* Well I feel sure. I've seen something like it but this is different—in the dress. Different in the man's dress, and also the young lady seemed dressed different. *But you've seen a man and a young lady?* Yes sir. (*Card is taken away, shuffled with the others, and given again.*) *Was that the young man and young lady that you saw first?* That I saw first, d'you mean? No, I don't think it is.

These examples bring out very clearly the patient's inability to respond to identity. In some cases, at least, it might appear that the deficiency is due to inadequate perception of the original figure. This might condition rejection of a card on the ground that some aspect or feature appears to the patient as genuinely novel. In order to check up on this possibility, the test was repeated in a slightly different form. This time, each card was presented for 2–2½ min. and a detailed description demanded. The recognition test was given after the removal of the last card.

7. ii. 40. *Descriptions:*

P 1. *Can you tell me anything about that?* It's an hotel, isn't it? *Go on—you describe it to me.* It's a bar. Couple of men having a chat together. Looks as if they were arguing a point about something or other. Fellow behind the bar looking at the others—he might have said something. *Can you describe the big man?* He's got a red waistcoat, blue jacket, blue trousers, hard hat on, pipe in his hand, paper in his other hand. *What's this down there?* A bag—portmanteau don't you call it? *Have you seen that before?* Don't think so, sir. If I did I didn't take any notice of it.

P 2. Well, they make one think of two courters. *What are they doing?* Well, the young lady's sitting on his knee. *Will you describe their clothes to me?* It seems as though he's talking to her, and she's looking at him pretty hard. He's got a blue suit on, the man. As for the lady, I don't know what you'd call her dress. *What colour is it?* Brown would you call it? Light brown? (*The patient is slightly red-weak.*) *D'you think she looks an attractive girl?* Yes sir.

P 3. Soldier's got some bags of earth on his head, it looks like. But he'll never carry five bags of dirt like that—not like that I should think, sir. If I had two on mine it would be enough. *Tell me about the rest of the picture. Are there other soldiers?* Well, there's two sitting beside them sandbags, and one behind the other there...and if he's got them full of soil he's very strong in the neck. *What's this fellow doing?* Well, he looks as though he's frightened, sir. Frightened lest they should fall. That's all I can tell you.

Recognition Test:

R 1 (*P* 3). *Have you seen this once or twice this afternoon?* It's the first time: I didn't notice the two sitting by them sandbags. *Have you seen one like that this afternoon?* You showed me one similar to it, but it wasn't like that one. *What about this man* (*central figure*)*? Was he the same?* He looked about the same man. I didn't take much notice of the man. I was looking at the shovel he was carrying. If he's got five bags of dirt he's very strong in the neck. *Was the other card like this one except for the two men?* Well, he hadn't got the sandbags on his head. If he had, I didn't notice them.

R 2. This the first time I've seen that one—to my knowledge.

R 3 (*P* 1). *Have you seen that one before this afternoon?* If I haven't seen that one I've seen one like it. *Would you say 'yes' or 'no'?* Yes, sir. *Are you sure?* Well, I'm not sure, but I think I have. *What makes you think you've seen it before?* Well, I saw the man behind the bar and the bottles.

R 4. No sir. *Sure?* Yes sir.

R 5. No sir. *Sure?* Well as far as I know I'm sure. *Have you seen anything like it?* I don't think I have. I didn't notice 'Fine Old Gin' before.

R 6 (*P* 2). *Have you seen that once or twice this afternoon?* This is the second time. *How do you know?* Well, I know I saw a fellow in a blue suit. Whether she was sitting on his knee or not I couldn't say. *But you think you've seen it before?* I think I've seen it before.

The complete recognition test was repeated after an interval of 20 min. On this occasion, the patient's responses were as follows:

R 1 (*P* 3). Yes sir. *How did you know?* I go by the sandbags on the man's head. The two sitting behind there and the one back there. I'll tell you what I think: If he's got five sandbags on his head full of dirt he'd be strong in the neck.

R 2. *Have you seen that once or twice this afternoon?* Once, I think. *Is this the first time you've seen it or have you seen it before?* This is the first time I've seen this card. *Have you seen any one like it?* I've seen something like it, but I don't think I've seen this one. *Why not this one?* I didn't notice the girl's legs, running away.

R 3 (*P* 1). I've seen that before sir. *How long ago?* About ten minutes or a quarter of an hour. *How do you know?* If I haven't seen that one I've seen one similar to it—with the bottles of beer and the glass standing on the table. *Have you seen that one before or one like it?* I don't think I've seen this one before. It was a different one. *What makes you think it was a different one?* I didn't notice that man there (left) when I noticed the beer.

R 4. No sir. *Have you seen one like it?* I've seen one similar to it but I haven't seen this one. I tell you I didn't notice 'Beer is Best'....

R 5. *Have I shown that to you this afternoon already?* It seems to look different. I saw something like it. I tell you I never noticed 'Fine Old Gin'; nor that old lady leaning up against the bar. I don't think I've seen that before.

R 6 (*P* 2). *Have you seen that once before this afternoon?* I don't think I've seen that before. No. I've seen one something like it. This is a different one to my idea. *In what way different?* The girl is sitting differently on the man's knee. They look younger too. *How was the other girl sitting?* She was sitting on one leg and not on two. *Have you seen it this afternoon or not?* Don't think I've seen it before.

There is some slight evidence from the above records that the frequency of paramnesia is slightly reduced by a more intensive scrutiny of the original material. On the first test, only one of the three cards elicits a well-marked paramnesia, but in this case, at least, it is plain that the reduplication cannot be due to any deficiency of apprehension. In the delayed recognition test, we find copious examples of paramnesia, for, with one exception, the patient treats the cards as new, though similar in varying degree to those previously shown. We may therefore conclude that the paramnesia has its origin in a deficiency of memory rather than in one of apprehension.

Case B. 29. iii. 40. Each card was shown for 1½–3 min. in order to control for possible deficiencies of apprehension. The patient was asked in each case for a full description of the picture. Her responses were as follows:

P 1. Bar of a public house. Landlord recounting something funny—no—having a lively argument or chat. No, he's recounting something. The man on the right looks a little simple, or a little doubtful of the tale. The man on the left—he's looking up and pondering the tale. *D'you see anything else?* The man's bag. Ah yes! Should I be right in thinking the man's glass on the right is empty and his on the left full? If so, I'm right in thinking he looks a little 'empty' in the face. Am I right in saying this right glass is empty? If so, they are perhaps waiting for each other to pay.

P 2. Oh doctor! Am I to describe it? It's a lady in a very summery dress—in fact it hardly is a dress; it is a dress I suppose. Flirting with a soldier—an airman. *Is there anything else you can see?* There's nothing else strikes me.

P 3. I can only describe the great ease with which he's carrying five bags of sand presumably. He looks as though things are blowing up at the back and he's unconcerned. That's all I can make of that. *How many men in the picture?* Four. *Anything else you can say about it?* He has five sacks on his head and a spade on his shoulder. *What about this fellow (left)?* Well he's going off the deep end in two senses, doctor!

Re-presentation of the whole series followed immediately on the conclusion of the last description. The responses in each case were as follows:

R 1 (*P* 3). *Have I shown that to you before?* Yes. *I have?* I should say yes. I might describe it as slightly different. *You'd say 'yes'?* I should say 'yes' on the surface.

R 2. No. *Sure?* Quite.

R 3 (*P* 1). That's not quite the same, doctor. That man's glass (left) was bigger and this one's (right) was not quite so narrow and not quite so high. The bag was different. *How?* Well it hadn't those creases, and I think the handle may have been different. Perhaps I'm wrong.

R 4. No, I haven't seen that.

R 5. No. *Sure?* Yes. You're talking about to-day? *Yes. You haven't seen it to-day?* No doctor, my impression is no.

R 6 (*P* 2) (perplexed). Well doctor, it's almost exact and yet it doesn't seem quite the same. *How does it seem different?* I'm not swearing it is different, doctor, but I'm thinking it is. I'm thinking the man's foot was a little more forward; it was showing beyond the near foot. *Any other differences?* I think the man and the girl had more colour in their faces.

We note that the new material is rejected unhesitatingly. The original three items all produce reduplicative paramnesias of varying degree of intensity. The paramnesia is least marked in the first card and most marked, perhaps, with the third. As with the previous patient, it is an apparent difference of detail which governs the response. The tendency to reduplication is brought out even more markedly in the following responses elicited on immediate re-presentation of the three test cards:

R 1 (*P* 3). Well if that's not the one the other one was very much like it. *Would you say yes or no to that?* I could think there was a slight difference, but it would have been very slight.

R 3 (*P* 1). I thought that man's glass was bigger. And had he got a pipe? I'm not sure of that. *Were the men the same?* To the best of my ability I should say they were.

R 6 (*P* 2). Yes. *Sure?* There seem to be two of these, doctor. One with the man with his right foot coming forward, and with more colour in his face. More colour in both their faces. And wasn't she looking up?

A delayed recognition test was carried out after an interval of four weeks. The following responses were produced:

25. iv. 40. *R* 3 (*P* 1). Yes. *You have?* I don't....Yes I have, doctor. *Sure?* I should say it was the same with a difference. In the other one the landlord had his left arm raised up. I don't know but that I've seen several others. You've got the same picture with several details different. The glasses, for instance. *When did you see this picture?* I should say the last time I came....I had an interview. *With me?* I don't think so, doctor. *But a doctor showed it you, did he?* To the best of my recollection. Or did I find it lying in something and look at it after it had been shown me?...I'm inclined to think it was not you who showed it to me. *How long ago was it?* That I saw that or a similar one? I suppose it was my last interview with the doctor. *A day ago?* A little more than that. *A week?* It seems recently.

R 6 (*P* 2). Yes I've seen that. *Sure?* I've seen perhaps two other versions of that, doctor. *Similar to that?* Yes. *Have you seen this one?* No. I saw one in which his right foot was showing in the front and one in which the girl's left arm was round his neck, and possibly one in which she was extending her arm and showing some crimson knickers, would it be? *Did I show it to you?* I can't tell you. *Does it seem very familiar?* You've got a series I imagine with the same idea.

R 1 (P 3). No, I've not seen that. It's the same idea worked up differently. *Seen something like that, have you?* Yes. *Any idea where you saw a card like it?* Can't be sure of that. The sacks weren't white ones and there weren't so many. It had variations as the other had.

The remaining three cards in the series were all rejected as unfamiliar. In one case there was a suggestion of the reduplicative phenomenon.

We note from these records of delayed recognition that the reduplication is now well-established. In the first case, the 'original' picture is said to differ from the present one in several points of detail, despite the fact that it is at first accepted. There is even a suggestion that *several* similar pictures may be involved. In the second case, the multiplication is even more definite. The present card is identified, but it is suggested that at least two other similar cards have also been shown. In the third case, the picture is definitely rejected, and the patient's verdict that it represents "the same idea worked up differently" epitomizes the character of the paramnesia. It is interesting to note the poor spatial and temporal localization of the original presentations.

The recognition test was repeated after a further lapse of several weeks and yielded substantially the same results.

Case C. This patient, as we have already said, showed a far less serious disturbance of memory than the other two patients. Indications of paramnesia, however, quite in line with the responses of the previous cases, were nevertheless obtained.

On 27. iv. 40, the material was presented in the usual manner and adequate descriptions of each of the three cards obtained. An immediate recognition test gave the following data:

R 1 (*P* 3). Yes. *Sure?* Yes.

R 2. No. *Sure?* Yes.

R 3 (*P* 1). Yes. *Sure it was that one?* Yes.

R 4. No, I didn't see that this morning. *Sure?* Yes.

R 5. No, I haven't seen that.

R 6 (*P* 2). Yes. *Sure it was that one?* Oh no! I don't believe it was. The other was in a different frock. *What sort of frock had the other one got on?* Blue. I didn't take much notice, but I think it was.

In only one case do we note the emergence of a paramnesia based on an alleged difference of detail. There was, however, more definite evidence of the phenomenon in a re-test on the following day:

R 1 (*P* 3). *Did you see that one yesterday?* Yes. *Sure?* Quite sure. That's the sandbags.

R 2. Yes I see'd that one. *Sure?* Yes.

R 3 (*P* 1). Yes. With the bag. *Sure?* Well I think there was two, wasn't there? One I know was that one. *What was the other one like?* In the other one the bag wasn't so big and the man was further inside than that. *So you've seen two like this?* It looks to me as though there's two different ones. *But this is one of them?* Yes, that's one of them.

R 4. Yes. I've seen that one yesterday. *Sure?* Yes. *Have you seen anything else like this?* No, I don't think so.

R 5. I don't know whether I've seen that one or not, don't think I did see that one yet. *Did you see one like it yesterday?* Yes I might have done. I don't think I saw that one, yet I've got a recollection I did.

R 6 (*P* 2). Yes I've seen that. There were two of those. One had got a blue dress and one a pink one. *Was this one of the two?* Yes. She was sitting on his knee. I don't think she was in the other one.

We see that there is a clear-cut reduplication in the case of *P* 1 and *P* 2. In both cases the picture is recognized, but it is argued that a similar picture has also been presented.

On a re-test, several weeks later, there was further multiplication. Again the cards were recognized, but in the case of *P* 1 and *P* 2, the patient asserted that she had seen *two* other similar cards in addition to that now shown. She was very confident as to the correctness of her surmise, and indicated several of the 'points of difference' between the cards.

V. RESULTS WITH OTHER TYPES OF MATERIAL

We may now pass on to a short description of analogous results obtained with different types of material. These may be grouped under five headings: (1) picture material; (2) verbal material; (3) common objects; (4) spatial environment; and (5) productions of the patient. Systematic tests were not undertaken, but contributory evidence was forthcoming in all fields. The majority of the tests were conducted with Case B.

(1) *Picture material.* The observations described above could be repeated at any time and with any type of picture material. We may give a few supplementary illustrations to prove that the paramnesias cannot be ascribed to any peculiarity of the original test cards:

Case B. 21. iii. 40. This was another test of immediate recognition. Five postcards, mainly of scenery, were shown each for 20 sec. and re-presented immediately after with five new cards. All five cards elicited paramnesias of the type described. Three of these may be quoted:

1. *A church.* That's similar, but the roof didn't go up like that and the building again was deeper coloured. The tower was not so narrow and not so tall. The whole thing was deeper coloured. That's my impression.
2. *A mosque.* I saw something similar, but I think I should recognize the real one. I don't think that was the one. *In what way is this different from the other one?* To begin with, it's paler; the parapet is narrower and not so deep. There were two figures in the background, I think, and these two figures were more to the right—they were all nearer this way, surely. And the one on the left was deeper coloured, surely. And this writing I don't remember seeing: I'm not saying it wasn't there.
3. *A cottage.* I saw something similar in colouring, but certainly not that. *How was the other one different from that?* Ah! It was deeper in colour. I should say there were two figures on the left in addition to the man. *Was the cottage the same?* The cottage I think was a longer and shallower one and the gates were not so high. The wall would not be so high, and I think the colouring of the sky would be richer.

Similar results, though rather less circumstantial, were obtained with Case A on this test.

It seems reasonable to conclude that the emergence of a reduplicative type of paramnesia in response to visual material is not bound up with any specific peculiarity of the test material.

It may perhaps be suggested that these paramnesias derive in part from a measure of assimilation between the different items in a test series. That this factor cannot however be the sole, or even the essential, cause of the phenomenon is clear from the following observation:

Case B. 21. iii. 40. A drawing of a man, a dog and a duck was shown to the patient on 14. iii. 40. She gave a full description of the drawing at the time, and was tested for recognition one week later:

Have you see that before? Something similar at any rate. *How was the other one different?* Well if you tell me I saw a different one, doctor, I'll enlarge upon it. I don't want to give way to imagination. I might have imagined that the man was older and taller; the brim of his hat not so big. And the dog was more a type of bloodhound, and bigger, and the duck perhaps smaller. I think the other duck—was a duck. This is a goose, isn't it? The dog hadn't a large tail; it had a tight-skinned tail—a tight-skinned dog. Should I be right in thinking the man had leggings and gaiters on? And smaller feet? An older man? I think he had a stick in his left hand and no lead.

In this case, the patient is far from confident as to the existence of two cards, but the similarity of the paramnesia to those already described is unmistakable.

(2) *Verbal material.* Detailed tests of verbal recognition were not undertaken. In several instances, however, a passage of prose read once to Case B and re-read after a few minutes elicited judgements identical in principle with those already described in reaction to the visual material. Fewer points of difference were adduced, but the patient almost always said that the passage was "not quite the same" as that originally read. These tests could not be carried out with Case A, as he was incapable of pronouncing a judgement of identity upon any passage consisting of more than about twenty words. A longer passage would invariably be treated as completely novel.

(3) *Common objects.* Some simple experiments on the immediate recognition of common objects were also made. For instance, the patient was handed a silver propelling pencil and told to examine it carefully. A few minutes later, the pencil was again given to the patient, who was asked to say whether it was the same or a different pencil. The front page of a newspaper was also used in the same way.

(*a*) *The pencil tests. Case B.* 23. v. 40. The patient was handed the pencil and instructed to scrutinize it carefully for 20 sec. It was then removed out of sight, and given back to her after 1 min.

Is that the pencil you saw just now? Well doctor, without being able to give a specific reason I should say it's not. It seems different round the top. But I can't swear that it is different.

The pencil was again removed and given back to her after a further lapse of 1 min.

Have you seen this before? (Examines it.) I should think that is the original one, doctor. You've certainly got two pencils there, doctor. Whether you've got three I can't swear. I shall have to leave that open whether you've got three. I don't remember so much dark (enamel) round the top. It seemed a tiny bit smaller.

The test was repeated in the same way with the same pencil on the following day:

Is that the pencil you saw just now? Roughly I should say that's the same one. I noticed the writing.

The pencil was removed and given back with the same instructions after 2 min.:

Is that the same pencil as I showed you just now? I should say not, doctor. This thing changes its appearance as you move it. The other had a longer, narrower appearance. I didn't notice it changed to that extent, doctor. I think perhaps it's the same pencil and you alter the top of it about. I said that "it may be" and not that "it is".

The pencil was again removed and given back after 6 min.:

Now what about this pencil? I may have seen it before, doctor, but it wasn't the one you've been showing me. It's smaller round the top. I should think you can manipulate the top somehow. All the same I'd venture to say that it's not the one I saw last.

The pencil was presented again 1 hr. later, and the patient asked to tell what she can about it.

It seems as though you've got three pencils, doctor. This thing (at the top) is wider and shorter than the others. I *don't* think I'm looking at one and the same pencil. This one does *not* go narrow as the other one did.

Case C. 24. v. 40. The pencil is shown for 20 sec. and the patient allowed to examine it carefully. It is given again after 1 min.

Is that the same pencil I showed you before or a different one? Yes (that's the one). *Sure?* I don't think it was. I couldn't tell you. *Why don't you think it's the same one?* Well I thought it had a pen at the end. No...I think it is the same one.

The test is repeated on 30. v. 40. The patient recalls the previous test, but is not sure whether the pencil is the same as before. The pencil is re-presented after 1 min.:

Does this seem to you to be the same pencil or a different one? It does and yet it doesn't....I didn't think it was quite so long as this. *Would you say it was the same pencil or a different one?* It might be the same.

The pencil was removed and given back after a further interval of 3 min.

Is this the same or a different pencil? Same. *Sure?* No, I don't think it is. The top of this one is bigger and the point is out. *How many pencils have you seen?* Two.

(*b*) *The newspaper test. Case B.* 23. v. 40. The patient was given the front page of the *Daily Telegraph* and told to look at it carefully for 2 min., paying special attention to the headlines. The paper was then removed, but restored to the patient 3 min. later.

Was this the paper I showed you just now? No. But I've seen it before, doctor. Surely. Wait a minute. My impression is that I've seen it before, but it's not the one you showed me. Wait a minute. (Reads) "Deadly Hush in Brussels"—that seems familiar....I've seen that before but I don't think that's the one you showed me. (The paper is removed for an instant and replaced.) *Was this the one I showed you?* This is the one you showed me first. Haven't you shown me one since?...Yes, this is the one—unless these papers are got up specially for the hospital tests.

This test was repeated from time to time and gave very similar results.

One may safely conclude from the above records that the paramnesia is by no means confined to reaction under the conditions of our card-recognition tests. Objects in common everyday use elicit very much the same types of response and bring out equally clearly this curious inability to treat a given object as identical on two successive exposures.

(4) *Spatial environment.* The relation of the reduplicative tendency in recognition to the wider problem of topographical orientation demands further study. Some attempt was made with one of the patients to assess how far the paramnesia described might influence reaction to the larger aspects of her environment. Thus we frequently asked Case B whether she recognized the room in which all the interviews took place. In some cases, she appeared to do so without difficulty; in other cases, however, there was evidence of some reduplication.

Case B. 7. vi. 40. *Where did you see me before?* Over here. *In this room?* I thought I turned to the right and not to the left. I think I turned to the room immediately on the right when I went in (to the ward). *Have you been in this room before?* If not, doctor, I've been in one absolutely similar. *Was it this one or a different one?* I should say it was the same but the direction is confused. *Have you seen this desk before?* My impression is it was a desk with drawers on *both* sides. (The present desk, which has stood in the room throughout, has drawers on one side only.) *So last time you saw me I was sitting at a different desk?* That's my impression, Doctor. *And this pencil, have you seen it before?* (the pencil used in the above tests). That's not as I saw it. There was a marking on the side. *And this chart?* (a visual acuity chart which has been hanging on the wall throughout). I can't say that this is familiar to me. There was something of that kind that I saw.

Case A, on the other hand, invariably failed to recognize both the examiner and the room in which all the interviews took place. On no occasion did he give any evidence of a reduplication comparable with his responses to the test cards.

(5) *Productions of the patient.* Some further experiments were made on the recognition of simple designs actually drawn by the patient. On 3. v. 40, Case B drew a copy followed by six successive reproductions of an incomplete rectangular figure. Fifteen seconds after completing the last reproduction, the latter was handed to her and she was asked whether or no it was her own handiwork.

Did you draw that? Yes, because I did the fiddling about at the end.

She was then handed the fifth reproduction, with a similar query:

I can't swear to that. I believe I did. I did that thing down there because I tried to straighten the line out. Otherwise I might question it.

To the fourth reproduction, her reply was:

I'm sorry, doctor, I can't remember doing that.

On 31. v. 40, the patient drew a copy and six successive reproductions of the Binet-Simon 'Key' pattern. Certain of her drawings were submitted for recognition 5 min. later.

The copy. Did you draw that? Yes I remember drawing that double line to make it shorter. But I can't say I remember that 'squiffy' line. I must assume that I drew it.

I didn't know my drawing is quite so bad. *Does it give you a sense of familiarity?* As being my own handiwork? Well I must assume it is because of that double line. I don't remember this bit here (the bottom). I don't think I did it. I do *not* recognize it as my own handiwork. I must assume I did it.

The second reproduction. Did you draw that? No. *Sure you didn't?* Yes. *Totally unfamiliar is it?* Yes. I don't think I did it. I feel as sure as I can be that I didn't do it.

The sixth reproduction. D'you think you did that? Yes.

In none of these instances is the paramnesia of the reduplicative variety, yet we note in several cases a differential forgetting affecting a part of the design which provokes a reaction not altogether unlike the consciousness of difference so prominent in the earlier recognition tests.

Spontaneous drawings were usually recognized correctly by this patient, even after an interval of several days. Occasionally, however, there was evidence of a similar kind of distortion in memory. Thus presented with a horse which she had drawn 5 min. earlier, the patient remarked, in a somewhat perplexed manner, that "it might have been a little slimmer, but it is the same horse"!

We may sum up our observations in the following paragraphs:

(1) Visual material re-presented after an interval was found to evoke in very many cases a peculiar variety of paramnesia. This may best be described as a failure, not of recognition, but of the capacity to respond to identity.

(2) The paramnesia may take one of two forms:

(*a*) The object in question is treated as altogether novel and as differing in important respects from the original object.

(*b*) The object is identified correctly, but is regarded as one of a number of similar objects all of which have been shown previously.

(3) There is some evidence that the tendency to reduplication increases with increase of time interval between the successive exposures. This, however, applies only between certain limits which vary from case to case.

(4) It is probable that the paramnesia may be evoked by all varieties of psychological material.

VI. DISCUSSION

A full-dress attempt at explanation of the phenomena which we have described is beyond the scope of the present paper. In the first place, our data are insufficient. In the second place, it must be borne in mind that the peculiarity of recognition here described is but one comparatively minor feature of the highly complex amnesic syndrome. But it is, nevertheless, possible to give some account of the principal factors at work in provoking the phenomena. These will certainly have to be considered in any more ambitious attempt at a psychological interpretation of Korsakow's psychosis.

First, there is the part played by *obliviscence.* No one would deny that the rate of forgetting in the Korsakow patient is tremendously accelerated. But the *differential* character of the forgetting has not been adequately acknowledged. Thus, again and again in the test situations, an object presented for recognition was rejected because *one aspect* struck the patient as genuinely novel. It seems that in such a situation the patient finds himself confronted with an object in part old and in part new. He is solicited for a judgement of identity or difference with respect to this object *as a whole.* The only available mode of response in such cases is to treat the latter as a *modified form* of the original object. Hence the reduplication: this object is new, but it is a modification of the original.

Obliviscence, in the sense of simple forgetting, cannot, however, be held responsible for all the cases of reduplicative paramnesia which we have recorded. There is an important class of cases in which an object presented to the patient for the second time is treated as novel on the ground that *certain of its characteristics appear significantly different from the corresponding characteristics of the original.* It is not merely that new features appear to have been added, but old features are said to be changed. This type of paramnesia was prominent in the responses of Case B, who often adduced a whole series of inconsistencies between the two exposures of a single card. In this variety of recognition failure, it is necessary to suppose that there has been some active change in the organization of past experience. Indeed it seems probable that the deficiency of recognition has its source in an aberration of recall.[1] Possibly we may speak of *constrained confabulation* in this connexion. At any rate, the subjective transformation of memory contents is undoubtedly a factor of importance in the genesis of paramnesia.

It is necessary also to consider in this connexion the recognition process in its affective aspects. Claparède (1), and after him MacCurdy (2), has urged that the Korsakow patient is typically deficient in the sense of *personal familiarity* with his environment. The patient is said to be virtually incapable of integrating contemporary experiences with the personality. It is claimed that this deficiency of synthesis precludes the appearance of a feeling of familiarity, of reference to the self, in responding to a repeated situation. We cannot enter here into the implications of this position, but it is reasonable to inquire whether a poverty of synthesis of this kind can be held responsible for the paramnesias described in these pages.

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[1] The fact that constructive changes introduced in recall may influence the character and accuracy of recognition in normal subjects has been demonstrated elsewhere by the present writer (4, 5). It is reasonable to assume that these effects will be even more pronounced in the Korsakow syndrome.

One of our patients, Case A, gave clear evidence in certain situations of the curiously 'de-personalized' mode of recognition which has been demonstrated by Claparède and MacCurdy. No definite evidence of such behaviour could however be obtained from the other two patients. But in all three cases there was good reason to believe that contemporary events failed to find an enduring place in the personality structure of the patient. Case A, in particular, displayed a quite remarkable restriction of his personality in accordance with the scope of the retrograde amnesia. Any new response which he could be induced to acquire might express itself in correct recognition. But this recognition lacked all sense of familiarity and reference to the personality. Indeed this patient appeared to experience familiarity solely in reference to certain persons in his immediate milieu, and in these cases the familiarity was invariably justified by misidentification of a confabulatory character. In the other two cases, both of whom at the time of the investigation were better oriented and less amnesic than the first, it appeared that contemporary events could be linked in some measure with the personality continuum. But even so, this linkage was comparatively feeble. Case B, as we have seen, was able to recognize without undue difficulty her own spontaneous drawings, but paramnesias were constantly evoked by the more artificial and less personal material used for the main tests. This observation in itself suggests that a defective sense of personal reference may play some part in provoking the phenomenon. At any rate, it is reasonable to suppose that an object poorly invested with personal reference would facilitate the emergence of paramnesias of a reduplicative type.

It is probable that further factors will have to be considered before a complete explanation of our results can be given. For example, the role of insight in inducing an attitude of extreme caution was prominent in one of our patients and may be of general significance.

The factor of suggestibility, constantly brought forward in discussion of the amnesic syndrome, may also play some part in conditioning the responses. Then there is the question of intellectual integrity. The apparent absence of reduplicative paramnesia in senile patients may indicate that a measure of intellectual critique is a necessary condition. The analysis of these various factors will provide a fascinating series of problems for future investigation. Lastly, there is the need for a fuller analysis of the paramnesia in relation to the major symptoms of the amnesic complex. This will be attempted in a forthcoming paper.

VII. SUMMARY

1. Illustrations are given of an hitherto unrecorded variety of paramnesia in three cases of an alcoholic Korsakow psychosis. It is pointed out that this paramnesia is essentially the expression of an incapacity to respond to identity.

2. Some possible causes of the phenomenon are discussed. Differential forgetting, transformation in recall, and deficient personal reference are adduced as the three most important factors.

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SOME FACTORS OF INTELLIGENCE

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I. Introduction

As a result of the analyses and discussions of recent years there is a widespread belief in the existence of a general factor, '*g*', running through all intellectual activity. Interpretations of this factor differ, Spearman accounting for it by quantity of energy, Kelley by heterogeneity, Thomson by the nature of the sampling process; but there is a general agreement that, however it arises, it is a convenient and satisfactory functional unity. The chief dissentient is Thurstone, and in his recent elaborate analysis of fifty-seven tests (3) he finds nine defined factors, none of which is common to all the tests. Thurstone's argument, however, is inconclusive, and Holzinger & Harman have shown, by analysing the same material, that the data do not preclude the existence of a general factor (2).

One of the strongest arguments in favour of the conception of '*g*' is the fact that in many of the standard group intelligence scales the intercorrelations of the tests can be explained in terms of a single common factor. And it seems natural to suppose that when the scale is extended by the addition of other tests which break the hierarchy, the single factor previously identified continues to exist, and should be sought for in the more complex material.

At the same time it must be recognized that the persistent functional unity of '*g*' is a hypothesis which requires confirmation and which may be subject to modification and even to rejection in the light of further evidence. For instance, when we are dealing with a complex correlation matrix into which 'g' is presumed to enter, along with other factors, it is not sufficient to extract a general factor which we identify with 'g' without giving adequate consideration to the effect which this has on the interpretation of the other common factors. All the factors should be considered together, and if the postulation of 'g' renders difficult a psychologically plausible interpretation of the factors as a whole, then it is necessary to revise the postulate and to modify the conception of 'g'.

II. EXPERIMENTAL PROCEDURE

(1) *Test material*

We have been fortunate in obtaining from Dr M. L. Fick, of the South African National Bureau of Educational and Social Research, permission to use extensive data collected by him (1), which make it possible to approach the problem from this point of view. Fick has extended an existing scale of the Binet type by adding fresh items at the upper levels, and in order to select these items he gave a number of different tests to 1497 school children. Our analysis sets out from the intercorrelations of ten of those tests, most of which are of a well-known character. They are as follows:

1. Formboards. These are the Worcester formboards, IIA, IIIA, IIB and IIIB.
2. Repetition of digits.
3. Repetition of digits backwards.

These two tests consist of the series contained in the Stanford Revision, with additions.

4. Match test. As this test, which was originally devised by Dr E. G. Malherbe, is probably unknown to English readers, a description of it may be given.

The materials required are a set of nine stiff cards, numbered 1–9, each measuring 3 by 12 in., and divided by lines into four equal squares. On these cards match sticks are glued in various patterns, as shown in Fig. 1. The subject is given about twenty additional match sticks with which to operate.

The procedure is as follows: The first card is shown to the subject for 6 sec.; it is then taken away and he is asked to reproduce the pattern with the loose matches supplied. The same procedure is adopted for each of the next five cards, but for the seventh card it is changed. The subject is now told that there ought to be four figures on the card, arranged in the same way as those on card 6. Three of them, however, have been lost, and the subject has to reproduce them with loose matches in the vacant squares on the card itself. Cards 8 and 9 are dealt with in the same way as card 7.

5. Absurdities. This includes items from Terman and Burt.
6. Porteus mazes.

7. Arithmetic reasoning. This is Terman material with additions.
8. Reasoning test, based largely on Burt.
9. Vocabulary test—50 words, given in the Terman fashion.
10. Dissected sentences—an extension of the Terman test of this nature.

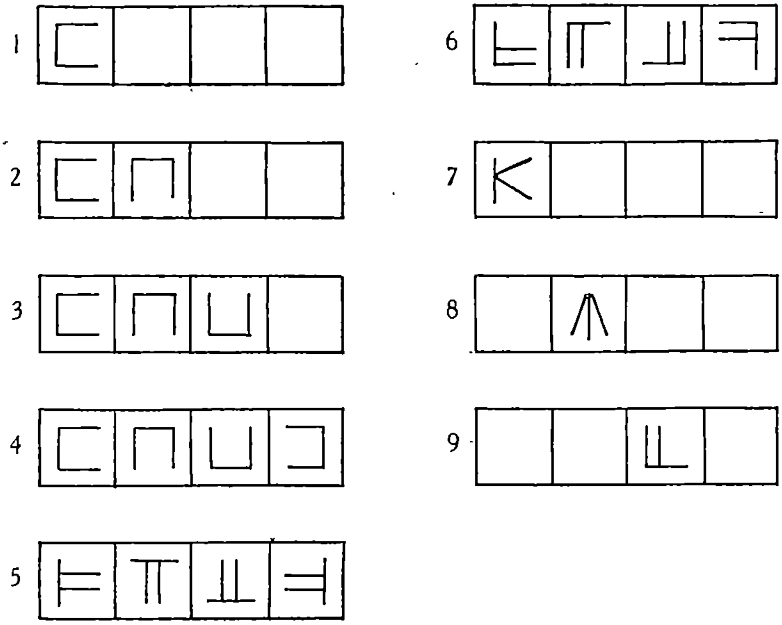

Fig. 1.

(2) *Method and subjects of experiment*

The tests were given individually by Fick himself to 1497 Transvaal school children, 723 of them being English-speaking and 774 Afrikaans-speaking. They were chosen from Standards V–X inclusive, and their age range was from 12 to 18. They were not, however, distributed uniformly over this range, the average age being almost exactly 15 years, and the probable error of the distribution 12 months. Two points call for comment here.

In the first place the children were selected on a definite basis. Fick's main purpose was to obtain age norms, and for this reason he selected and tested only those pupils in each standard whose age did not deviate by more than 6 months from the median age for the standard, calculated for the whole country.

Secondly, there was a language complication. Some of the tests are verbal in nature, particularly 9 and 10, and care had to be taken to equate these tests in the two languages. For this purpose Fick relied on two considerations. On the one hand he believed that his principle of selection ensured that the two halves of his population were approximately equal to one another in ability and schooling; and on the other hand, when two groups, of English- and Afrikaans-speaking children respectively, obtained equal average scores on performance tests, numbers 1, 4 and 6, he assumed that they were of equal ability and therefore expected them to show equal average scores also on the language tests. Accordingly, the form of the language tests was adjusted until such results were secured. The difference between the tests in the two languages is probably not greater than the difference between two forms of a single test in the same language.

On the whole the results do not seem to us to be vitiated by the use of the two languages, but the method of selecting the subjects introduces an uncertainty. Undoubtedly the correlation with age is enhanced, as the extreme cases at each age are rejected. This does not involve the introduction of any fresh common factors into the analysis, but it must make some difference to the saturation coefficients themselves. The general effect is to limit the variance of each test as compared with an unselected sample of the same size drawn from the total population. But as we are unable to give any measure of the extent of this limitation, all we can do is to treat the given variance as unity, and to recognize that somewhat different saturation coefficients of the final factors might be obtained from an unselected sample. There seems to be no reason to believe, however, that the analysis itself would be fundamentally altered.

III. TREATMENT OF TEST RESULTS

(1) *Factorial analysis*

The intercorrelations of the ten tests, as calculated by Fick, are presented in Table I. This matrix was submitted to factorial analysis by Thurstone's centroid method. Fick himself made a first approximation to the communalities by taking the highest figure in each column. From the factor loadings obtained in this way we made a second approximation, and from the new factor loadings a third approximation was reached. The final centroid matrix, which is presented in Table II, is thus the outcome of three successive applications of the centroid method.

Five factors appear to be necessary. The probable error of the average correlation coefficient is 0·0166, and the average residual does not come down to this value until five factors have been extracted. If only four factors are extracted, the residuals are too large to be accounted for in terms of random error. Five is therefore the minimum number of common factors by reference to which the correlation table may be explained.

Table I. *Correlation matrix*

Decimal points are omitted

	1	2	3	4	5	6	7	8	9	10
1	—	027	103	231	241	178	254	217	138	109
2	027	—	477	137	164	115	194	169	183	144
3	103	477	—	263	166	266	256	249	338	261
4	231	137	263	—	184	200	249	293	249	217
5	241	164	166	184	—	047	243	303	203	179
6	178	115	266	200	047	—	267	258	263	273
7	254	194	256	249	243	267	—	319	307	130
8	217	169	249	293	303	258	319	—	348	205
9	138	183	338	249	203	263	307	348	—	537
10	109	144	251	217	179	273	130	205	537	—

Note. There is a discrepancy in the table between the two versions of the value r_{310}. We have takèn the mean of the two values, viz. 0·256.

Table II. *Centroid matrix*

	I	II	III	IV	V	h^2
1	0·353	0·327	0·058	0·099	0·087	0·252
2	0·441	−0·283	−0·544	0·031	0·028	0·572
3	0·584	−0·269	−0·260	0·154	0·031	0·505
4	0·461	0·131	0·072	0·104	0·110	0·258
5	0·432	0·331	−0·148	−0·315	0·115	0·431
6	0·446	−0 069	0·193	0·266	−0·075	0·317
7	0·516	0·179	−0·019	0·125	−0·173	0·344
8	0·548	0·189	0·035	−0 020	−0·127	0·354
9	0·636	−0·195	−0·240	−0·231	−0·143	0·574
10	0·534	−0·341	0·372	−0·229	0·221	0·641

The factors obtained directly by the centroid analysis have of course no immediate psychological significance, and the axes must be rotated. This process cannot be undertaken in a purely mechanical fashion, but must be guided by psychological considerations. Some of the points we have allowed for here are as follows:

(1) All the coefficients in the correlation table are positive, and although there are several possible explanations of this, the simplest one is the existence of a general factor, such as '*g*', with which all the tests are positively loaded. Throughout the process of rotation we tried if possible to preserve such a factor.

(2) The correlation between tests 9 and 10 is unduly high in comparison with the rest of the table, and this suggests the presence of a verbal group factor.

(3) The correlation between tests 2 and 3 is also high, implying the presence of another group factor. *A priori* its precise nature is not clear,

for it may consist either of facility in dealing with numbers or of some wider memorizing or retentive ability.

(4) One further consideration is relevant here. It is highly probable that all the common factors underlying the tests are positive, and hence, when the axes have been rotated to their final position, there should be no significant negative loadings.

There is, however, one value in the correlation table which makes it difficult to reconcile the first and last of these assumptions. The correlation between test 5 (absurdities) and test 6 (mazes) is only 0·047. Both of these tests would commonly be regarded as having a reasonably high saturation with '*g*', and yet if this were so, the resulting correlation ought to be much larger than that experimentally found. The correlation r_{56} is the lowest in both columns in which it appears, and the correlations of these tests with test 2 (repetition of digits), into which presumably '*g*' does not enter in any high measure, are on the average three times as large as their correlation with one another. Of course it may be that the error of r_{56} is unusually big. But if the correlation is augmented by three times its probable error it still falls short of 0·1, and thus leaves little room for a general factor of any magnitude. Moreover, when the correlation between tests 5 and 6 is reconstructed from the factors obtained by the centroid analysis—and these of course are determined by all the data in the table and not only by the correlation between tests 5 and 6 themselves—the figure obtained is 0·046, a result which is hardly compatible with the idea that its original value was seriously in error.

It seems therefore that the first and fourth of the assumptions which we were prepared to adopt may prove inconsistent. If '*g*' is significantly present in all the tests, there must be other factors with negative loadings to account for the low value of r_{56}. If, on the other hand, negative loadings are excluded, there is no general factor in all the tests. This dilemma is a real one, and we had to choose between the first and the fourth of the assumptions. We were prepared to accept '*g*' as commonly understood if we could give a psychological meaning to the negative loadings of the other factors which its retention entailed. But we failed in this endeavour. None of the bi-polar factors which we considered gave any promise of a psychological meaning, and hence in the end we abandoned the first assumption in favour of the fourth.

The method of rotation adopted was primarily graphical. The factors were plotted against one another in pairs, and when an angle of rotation was chosen, the new factor loadings were calculated by the suitable orthogonal transformation. In the end seven rotations were retained, and the transformation matrices which they involve are shown in Table III. The ideas governing these rotations are (*a*) the avoidance of significant negative loadings, (*b*) the isolation of two factors, one of which is defined mainly by tests 9 and 10 and the other mainly by tests 2 and 3, and (*c*) the possibility of giving a psychological meaning to the remaining three factors.

Table III. *Transformation matrices*

$$\begin{array}{c} \begin{array}{cc} \text{I} & \text{II} \end{array} \\ \begin{bmatrix} 0\cdot84227 & 0\cdot53905 \\ -0\cdot53905 & 0\cdot84227 \end{bmatrix} \\ T_1 \end{array} \quad \begin{array}{c} \begin{array}{cc} \text{I} & \text{III} \end{array} \\ \begin{bmatrix} 0\cdot50387 & 0\cdot86378 \\ -0\cdot86378 & 0\cdot50387 \end{bmatrix} \\ T_2 \end{array} \quad \begin{array}{c} \begin{array}{cc} \text{III} & \text{IV} \end{array} \\ \begin{bmatrix} 0\cdot93881 & 0\cdot34444 \\ 0\cdot34444 & -0\cdot93881 \end{bmatrix} \\ T_3 \end{array} \quad \begin{array}{c} \begin{array}{cc} \text{I} & \text{III} \end{array} \\ \begin{bmatrix} 0\cdot97168 & -0\cdot23630 \\ 0\cdot23630 & 0\cdot97168 \end{bmatrix} \\ T_4 \end{array}$$

$$\begin{array}{c} \begin{array}{cc} \text{III} & \text{V} \end{array} \\ \begin{bmatrix} 0\cdot82728 & 0\cdot56180 \\ -0\cdot56180 & 0\cdot82728 \end{bmatrix} \\ T_5 \end{array} \quad \begin{array}{c} \begin{array}{cc} \text{II} & \text{III} \end{array} \\ \begin{bmatrix} 0\cdot98058 & -0\cdot19612 \\ 0\cdot19612 & 0\cdot98058 \end{bmatrix} \\ T_6 \end{array} \quad \begin{array}{c} \begin{array}{cc} \text{IV} & \text{V} \end{array} \\ \begin{bmatrix} 0\cdot96153 & -0\cdot27472 \\ 0\cdot27472 & 0\cdot96153 \end{bmatrix} \\ T_7 \end{array}$$

The final factorial matrix is given in Table IV, and in Table V the percentage of the variances to be attributed to each factor.

Table IV. *Factorial matrix*

	I	II	III	IV	V
1	0·048	0·441	0·168	−0·002	0·165
2	0·755	0·002	−0·016	0·038	0·013
3	0·635	0·040	0·248	0·054	0·189
4	0·173	0·316	0·250	0·080	0·245
5	0·209	0·528	−0·028	0·326	−0·040
6	0·162	0·091	0·477	−0·031	0·233
7	0·254	0·360	0·386	−0·019	0·005
8	0·218	0·390	0·368	0·138	0·002
9	0·244	0·077	0·528	0·478	0·039
10	0·143	−0·071	0·361	0·592	0·368

Table V. *Percentage variance*

		I	II	III	IV	V
1	Formboards	—	19	3	—	3
2	Digits forwards	57	—	—	—	—
3	Digits backwards	40	—	6	—	4
4	Match test	3	10	6	1	6
5	Absurdities	4	28	—	11	—
6	Mazes	3	1	23	—	5
7	Arithmetic	6	13	15	—	—
8	Reasoning	5	15	14	2	—
9	Vocabulary	6	1	28	23	—
10	Dissected sentences	2	1	13	35	14

(2) *Interpretation of the factors*

(*a*) The nearest approach to a general factor is the first one, but it cannot be '*g*'. It looks like a memory factor. It is present in a high degree in the two tests where one would expect such a factor, viz.

2 (digits forwards) and 3 (digits backwards); it is absent in test 1 (formboards); and it is present in a low but almost uniform degree in the other tests. These results appear to be compatible with the interpretation of it as immediate memory span, although of course it may be some more complex memory function.

(*b*) The fourth factor is obviously verbal. Its main loads are in tests 10 (dissected sentences) and 9 (vocabulary). It also enters into test 5 (absurdities), and has a small but presumably significant load in test 8 (reasoning). This factor may also be complex, and the data are hardly sufficient to allow it to be defined more closely.

There is nothing surprising in the appearance of these two factors in the battery, as their presence was suggested beforehand by the correlation table, and we deliberately looked for them. The remainder of the analysis however appears to be new.

(*c*) In the fifth factor the highest load is in test 10 (dissected sentences), and then follow tests 4 (matches), 6 (mazes), 3 (digits backwards) and 1 (formboards), in that order of magnitude. The other loads are negligible. In all the tests in which the factor is significant the tasks involve the arrangement or rearrangement of sensory material, and the interpretation which we suggest is that it consists in some kind of manipulative fluency or elasticity in dealing with perceived sensory data. It is a form of dexterity, but mental and not manual, and, so far as the present tests go, confined to perceived objects.

(*d*) We are now left with the second and third factors. Both are present, in almost equal proportion, in tests 4 (matches), 7 (arithmetic) and 8 (reasoning). Although both are also present in test 1 (formboards) the second factor has much the greater weight. This second factor is present, and the third absent, in test 5 (absurdities). On the other hand the third factor is present and the second absent in tests 9 (vocabulary), 6 (mazes), 10 (dissected sentences) and 3 (digits backwards). Incidentally it may be remarked here that the analysis accounts for the smallness of the correlation between test 5 (absurdities) and test 6 (mazes). Each of them correlates reasonably well with the other tests, but, apart from the memory factor, they do so by virtue of separate factors, and consequently do not correlate with one another.

Neither the second nor the third factor can plausibly be identified with '*g*' in its ordinary interpretation. If the third factor is interpreted as '*g*' the absence of it in test 5 (absurdities) is difficult to explain, and the low saturation of test 1 (formboards) is also a stumbling-block. On the other hand the attempt to identify '*g*' with the second factor is precluded by the absence of that factor from tests 6 (mazes), 9 (vocabulary) and 10 (dissected sentences).

In point of fact '*g*' seems to be divided here into two separate and independent factors, and the problem is how to describe them. The critical tests are 5 (absurdities), 6 (mazes), 9 (vocabulary) and 10 (dissected sentences). What does test 5 (absurdities) possess that 6 (mazes), 9 (vocabulary) and 10 (dissected sentences) lack, and what does it lack that is present in them? If test 6 (mazes) can be taken as a guide, the third factor conditions the ability to see a path through a maze and to follow it. If we separate this ability from the contributions due to memory and to perceptual dexterity, it may be regarded as the ability to make, or isolate, and follow a plan. It is not a visual factor, and is not confined to sensory material, for it is equally marked in the ability to define words and to perceive the meanings of disarranged sentences. It would thus appear to be a synthetic and constructive ability as well as an analytic one. It is the power to find or make a significant pattern in a mass of irrelevant material.

(*e*) In comparison with this factor the second one appears negative, and the main guide to it is the part it plays in the perception of absurdities. This perception is not immediate, but involves inference and implication and the apprehension of a general idea. For the subject is required to show why the given statements are absurd or how the premises involve contradiction. If he has such an ability he will be in a position, in many tasks, to rule out certain lines of thought or action. He will see that certain paths lead nowhere, and will not require to go to the end of each of them to discover that he is in a cul-de-sac. The ability therefore may be described as one of logical elimination.

If this conception is right, the presence of the second factor in test 1 (formboards) is clearly intelligible. The perception that a particular block cannot fulfil the conditions required for the completion of a pattern, no matter how it is turned, will save endless trial and error and be of the utmost value for the performance of the task. Unless the subject sees that certain general conditions have to be satisfied in a formboard problem he is at the mercy of chance, nor indeed will he have much success unless he can go further and deduce from the conditions which he has grasped the exclusion of all the wrong shapes.

The second factor, as we have seen, is lacking in tests 6 (mazes), 9 (vocabulary), 10 (dissected sentences) and 3 (digits backwards). In none of these cases is it feasible to exclude unnecessary steps and minimize trial and error by means of implications drawn from a principle or general idea. In the maze a blind alley cannot be actively eliminated unless the eye travels to the end of it. Wrong definitions of words are not excluded by inference from a general idea. In the test of disarranged sentences there are few if any principles to be appealed to, and once the right idea is obtained, the answer is given immediately. And finally, in repeating digits backwards it is fatal to proceed by elimination. The moment alternatives present themselves explicitly to the subject's mind he is confused and lost.

From a comparison of the two factors the following difference emerges. When the third factor is dominant, irrelevancies are brushed aside or neglected because the thinker is holding to something which he sees clearly, or, to change the metaphor, he does not take bypaths because he is following a defined road. On the other hand, when the second factor is dominant, irrelevancies are set aside because they are perceived to be irrelevancies. Extensive trial and error is avoided, because attention is given to false procedures and their implications are seen. From this point of view the presence of both factors in the match test, in reasoning and in arithmetic seems completely intelligible. For the second factor by itself does not go far enough. In test 5 (absurdities) it may be adequate, since the test itself requires no more than the perception of the absurdity; but when more than this is needed it fails. Although it excludes mistakes and closes bypaths, by itself it supplies no positive contribution towards finding the true road or providing a solution. It does not lead one through the maze, nor give the proper explanation of a word, nor rearrange a sentence. For these we have to rely on the third factor; and in ordinary reasoning processes, whether dealing with arithmetical or other material, as well as in the match test, both factors are important.

IV. CONCLUSIONS AND FURTHER TREATMENT OF RESULTS

The results which we have reached are difficult to reconcile with the accepted conception of '*g*' as a unitary character, and since there is a reasonable quantity of evidence in favour of this conception, some comment is called for. Undoubtedly batteries of tests have been applied where the correlation table can be accounted for by a single factor; and the problem is to explain how this can happen if intelligence tests are really as complex as our analysis would suggest.

In the first place, it may be noted that not every grouping of intelligence tests satisfies the tetrad equation criterion. It is well known, for example, that tests of the Binet type involve more than one common factor. Secondly, a verbal factor has been recognized for some time, and undoubtedly this factor does enter into batteries of tests which satisfy the tetrad criterion. That is to say, these tests, although they appear, when analysed by themselves, to imply only one common factor, are really complex and involve at least two common factors. Moreover, it is difficult to believe that a memory factor, such as we have isolated, does not also enter into them. Thirdly, tests which satisfy the tetrad criterion and are grouped in a battery to measure '*g*' have in many cases been selected under the guidance of this criterion. They are the survivors of larger batteries from which tests which disturb the hierarchy have been ejected. And when this procedure is adopted it is possible to obtain a residuum of tests which, analysed by themselves, are consistent with the assumption of a single common factor but which in reality are complex.

We may illustrate this situation from the battery which we have been considering. Ignoring for a moment the analysis which has just been made, let us adopt the procedure which would be natural on the assumption that there is a single general factor, and that the hierarchy is disturbed only by group factors. Wherever a group factor is suspected to link two or more tests, we shall retain only one of these, and by this method derive a sub-battery which will measure '*g*' as adequately as possible. Obviously tests 9 and 10 cannot both be retained as they have a verbal factor in common; let us omit 10 and retain 9, which has notoriously a high correlation with '*g*'. Again, tests 2 and 3 cannot both remain, but neither has a strong claim, for they would normally be regarded as poor tests of '*g*'. Hence both should probably be omitted. Finally, tests 5 and 6 cannot be incorporated in the battery together because of their low intercorrelation. Let us retain test 6, which has greater scope and has been more widely used. This leaves us with tests 1, 4, 6, 7, 8 and 9. Three of these, it may be noted, are performance tests, and accordingly there is still some risk of a group factor remaining.

Taking these six tests, let us examine their correlation matrix. Assuming a single common factor and applying Spearman's well-known formula,[1] we obtain the following factor loadings:

Tests	1	4	6	7	8	9
Factor loads	0·386	0·483	0·456	0·572	0·592	0·521

Reconstituting the correlations by means of these factor loadings and subtracting them from the original correlations, we obtain a set of residuals, the mean numerical value of which is 0·022. The probable error of the mean correlation coefficient in this reduced table is 0·016, and the residuals therefore appear to be slightly too large to be accounted for by random error. Presumably there is still a group factor involved in the correlation table. As already suggested, this may be associated with the performance tests, and *a priori* an overlap is likely between tests 1 and 4, both of which involve manipulation. Let us drop test 1.

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[1] *Abilities of Man*, Appendix, equation (21).

Applying the same method of analysis to the remaining five tests, we obtain the following factor loadings:

Tests	4	6	7	8	9
Factor loads	0·456	0·455	0·550	0·601	0·566

The average residual is now 0·010, which is less than the probable error of the average correlation coefficient. This reduced battery would obviously satisfy the tetrad equation criterion, and '*g*' might well be postulated as the explanation of the intercorrelations of these five tests.

This result may be compared with the factorial analysis of the same tests based on their examination along with the rest of the original battery. The relevant figures, extracted from Table IV, are reproduced here for convenience, together with the values of *h*, which enable a direct comparison to be made with the saturation coefficients of '*g*' presented in the preceding paragraph.

Table VI

Test	I	II	III	IV	V	*h*
4	0·173	0·316	0·250	0·080	0·245	0·508
6	0·162	0·091	0·477	−0·031	0·233	0·563
7	0·254	0·360	0·386	−0·019	0·005	0·586
8	0·218	0·390	0·368	0·138	0·002	0·595
9	0·245	0·077	0·528	0·478	0·039	0·757

If the analysis given in Table IV is sound, it will be observed that there are two factors common to the five tests, together with three group factors. And it may be added that the communalities are significantly higher than those obtained when the five tests are examined in isolation. The unity of '*g*' therefore, in this instance at least, would appear to be spurious in the sense that it does not maintain itself when the tests are made part of the larger battery.

A difficulty remains. The correlation matrix of the five tests which we have just discussed involves two general factors and three group factors; nevertheless these five factors can apparently be replaced by a single factor, and the matrix treated as if it were of rank one. In general a reduction of this kind cannot be made unless (*a*) the group factors are insignificant, and (*b*) the general factors are proportional to one another. Neither of these two conditions is fulfilled in the present case, and it seems a refuge of despair to say that the result is merely accidental.

The situation would be an impossible one if the data were infallible, and a matrix which is genuinely of rank five cannot be reduced to rank one. But the position is changed when the data are fallible, for the two factorial matrices are not equivalent to one another, and hence the problem of reducing one to the other does not arise. Both give approximations to the original correlation matrix, neither of them differing from the data by larger values than can be accounted for by random error. But they do not differ from the original in the same way, and the residuals obtained in the two cases are different. If the correlation matrix constituted from the five factors of Table VI is analysed anew and a single centroid factor extracted from it, the residuals average 0·014, a value which is not incompatible with the assumption that one common factor is sufficient to explain the table. Thus the difference between the two analyses is covered by random error.

A further consideration may be mentioned here. If an artificial correlation matrix is constructed from a number of factors equal or nearly equal in number to the variables, and an attempt is made to analyse it by the centroid method, it will frequently be found, particularly if the number of variables is small, that the first factor extracted in this way accounts for most of the co-variance and that relatively little is left for the others. Accordingly, if allowance has to be made for probable errors, all factors other than the first may easily be swamped. This appears to be what has happened in the case we have been discussing, and we suggest that it is not of infrequent occurrence.

Of course the group of five tests which we have isolated here cannot be regarded as a normal representative of those batteries which are commonly employed to measure '*g*', and the composition of the latter may differ considerably from that of the former. Nevertheless we may claim that our analysis creates a presumption that '*g*' is complex, and obviously the next step is to analyse a more orthodox battery of tests, commonly recognized as measures of '*g*', together with other tests similar to those which we have discussed in this paper.

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‘TYPE’-FACTORS IN AESTHETIC JUDGEMENTS

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I. *The problem* (pp. 262–263).
II. *Ranking of pictures* (pp. 263–264).
III. *Results and conclusions* (pp. 264–266).
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I. The problem

When we analyse a table of correlations between the rankings of pictures or other aesthetic material by a number of subjects, we almost always find that the first factor to be extracted is a general factor with saturations which are positive throughout. The nature of this general factor has been discussed in a previous article (1); the ‘*T*’-factor, as it was called there, was shown to extend over eighteen different tests of visual aesthetic appreciation, and to correlate with general factors extracted from tests of colour appreciation, appreciation of polygonal forms, and of preferences for odours.

When the influence of this factor is eliminated, a secondary, bipolar factor can be found, which has positive and negative saturations in roughly equal numbers. Factors of this kind may be of great interest and importance, dividing as they do the population into different groups or ‘types’; but they also present special difficulties to the investigator. As Davies has shown in her survey of researches involving correlations between persons, the influence of the bipolar factor is generally considerably smaller than that of the general factor; on the average, she found the general factor to be approximately five times as strong as the bipolar factor (2) (p. 412).

She also found that in the majority of cases the residuals on which the bipolar factors were based were not statistically significant. ‘In forty-four out of the forty-eight researches...examined the first factor will account for all the variance and covariance within the limits imposed by the probable error” (p. 418). In particular, in none of the twelve researches involving aesthetic material was a statistically significant second factor to be found.

We are, then, faced with the problem of increasing the relative influence of the bipolar factor, and of reducing or eliminating the influence of the general, positive factor. This problem, as I shall endeavour to show, can best be solved by the suitable selection of experimental material.

II. RANKING OF PICTURES

Great differences in 'goodness' among the pictures in a test produce a particularly strong general factor in that test. Consequently, as far as practicable, the pictures in each of the five sets used in this research were selected with a view to making them equal in 'goodness'; for that purpose only pictures of acknowledged merit were chosen. It might be objected that such a conventional standard is not necessarily the correct one to take; the relative success of our effort to reduce the importance of the '*T*'-factor, and to increase the importance of the various bipolar factors, is perhaps sufficient answer to this objection.

The five sets of pictures used are described below. They were:

Set A. Fifty-one landscape paintings, reproduced on postcards. The selection of artists is fairly representative, covering the period from Dürer's time to our own.

Set B. A further fifty-one landscape paintings, reproduced on postcards. The selection was similar to that described above.

Set C. Thirty-two portrait paintings, reproduced on postcards. The artists whose work is included here range from the early Italians to Modigliani and Kissling.

Set D. Thirty-two photographs of statues. The artists whose work is included were Kolbe, Maillol, Barlach, and Klimpsch.

Set E. Fifty-one landscape photographs, uncoloured, by a well-known Austrian artist, Dr Defner. All these pictures were hand-produced. Dr Defner himself was kind enough to select 108 photographs, from his stock of several thousand, which to him appeared of roughly equal merit; a further selection was then made by three judges who had scored particularly highly in the '*T*'-test.

Thus altogether two hundred and seventeen pictures were used in this part of the investigation. Fifteen subjects were asked to rank the pictures in each set in order of liking, using a scheme of grouping which closely approximated to the normal distribution curve. The subjects were artists, university students, bank clerks, typists, and teachers, eight women and seven men. Their ages ranged from about twenty to seventy.

These rankings were correlated, and from each of the five tables of correlations two factors were extracted. The first factor extracted was significant in every case; the second factor was significant in every test except the 'statues' test. The significance of the second factor was tested by examining the significance of the residuals on which it was based; the criterion used was Fisher's test of the difference between the theoretical and the actual correlations, expressed in terms of their inverse hyperbolic tangents ($z = \tan h^{-1} r$).

III. RESULTS AND CONCLUSIONS

The percentages contributed to the variance by the first and second factors in each of the five tests are given in Table I.

Table I

	Test	Percentage of variance Factor 1 %	 Factor 2 %
A	Landscapes A	35	12
B	Landscapes B	31	12
C	Portraits	27	17
D	Statues	29	8
E	Photographs	14	11
	Average	27	12

In three of the tests, the 'T'-factor is the first to appear; in the two Landscape tests its influence has been sufficiently weakened to let the bipolar factor appear first. In these two tests, the 'T'-factor appears as a bipolar factor, which is of course due to the method of analysis which inevitably makes the second factor to be extracted have both positive and negative saturations.

Our reason for assuming that the factor appearing in all these tests is 'T' lies in the fact that the factors extracted from the two Landscape tests and the Photographs test correlate significantly with those extracted from the Portraits and Statues tests; but as these two tests had also been included among the eighteen 'T'-tests, we know that both are highly saturated with 'T' (cf. (1), Table I). The intercorrelations of the five tests for this factor are given in Table II, together with their standard errors.

Table II

	B	C	D	E
A	0·341 ± 0·24	0·147 ± 0·26	0·492 ± 0·21	0·131 ± 0·26
B	—	0·459 ± 0·21	0·666 ± 0·15	−0·050 ± 0·27
C	—	—	0·446 ± 0·22	0·126 ± 0·26
D	—	—	—	−0·030 ± 0·27

When this table is analysed, the saturations shown in Table III are found for the five tests.

Table III

	Test	Saturation
A	Landscapes A	0·519
B	Landscapes B	0·714
C	Portraits	0·551
D	Statues	0·829
E	Photographs	0·070
	Variance	0·355

We are not, however, primarily concerned with the '*T*'-factor; the table given above lends support to the conclusions reached in our previous paper, by showing that the influence of '*T*' extends also to landscape paintings and photographs. But our chief interest lies in the other factors, an examination of which may throw further light on the nature of aesthetic judgements.

The first question that suggests itself in this connexion is: What is the meaning of these bipolar factors? We can answer this question by examining the pictures which characterize the positive and negative aspects of the factors respectively.

As regards the two landscape tests, the answer is clear enough. We are dealing here with an opposition between such artists as van Gogh, Corinth, Kokoschka, Cézanne, and Gauguin on the one hand, and Constable, Ruisdael, Rubens, Wilson, and Hobbema on the other. The one group of subjects prefers the modern, impressionistic, colourful pictures; the other group prefers the older, more conventional, less colourful pictures. Such a dichotomy has of course often been suggested on theoretical grounds; Dr Dewar also found some evidence of it in her research ((3), p. 36), but none of the residuals on which this suspected factor was based was as high even as three times its probable error.

As regards the portraits, we find a similar opposition between artists such as Modigliani, Augustus John, and Laurencin on the one hand, and Reynolds, van Eyk, and Botticelli on the other. Again one group prefers the modern, colourful pictures, the other group the older, more conventional ones.

The distinction in the photographs test is not so clear, but one group seems to prefer the sunlit, bright, happy landscapes, with trees and clear skies, while the other group prefers dark, foreboding landscapes, with overcast skies and wild, drifting clouds.

The main opposition in the statues test seems to be between the art of Kolbe and Klimpsch, and that of Barlach and Maillol. This opposition has been expressed with great insight by Carls, in his book on Barlach: "Not adoration of form but adoration of truth determined Barlach's creative life....Thus it follows that Barlach is a destroyer of form (Formaufwühler), not a confirmer of form (Formfestiger). Kolbe creates the beautiful, Barlach the characterful" ((4), p. 18).

From the descriptions given above of the bipolar factors entering into these five tests, it will be fairly clear that those extracted from the two landscape tests and from the portraits test are very similar. Does this similarity also extend to the two other tests? This question can best be answered in the form of a table giving the intercorrelations of the bipolar factors (Table IV).

Table IV

	B	C	D	E
A	0·957 ± 0·02	0·701 ± 0·14	0·548 ± 0·19	0·327 ± 0·24
B	—	0·813 ± 0·09	0·496 ± 0·20	0·437 ± 0·22
C	—	—	0·406 ± 0·22	0·642 ± 0·16
D	—	—	—	0·340 ± 0·24

When this table is analysed, the saturations shown in Table V are found for the five tests:

Table V

	Test	Saturation
A	Landscapes A	0·867
B	Landscapes B	0·939
C	Portraits	0·876
D	Statues	0·559
E	Photographs	0·542
	Variance	0·601

It would appear, then, that we are dealing with one factor running through all the five tests. This factor has been called the '*K*'-factor; it differentiates, as we have seen, those who like modern art, bright, sunny photographs, and Kolbe statues, from those who like the older masters, cloudy, foreboding photographs, and the statues of Maillol and Barlach. The following suggestion may be offered as an explanation of this factor.

Gestalt psychologists, in particular Hornbostel, have drawn attention to what they have termed 'intersensory perception' (cf. (5), pp. 145 *et seq.* for a summary of this work). In particular, stress is laid on a 'brightness factor', which is apparent in music, vision, and other sense modalities.

It appears possible that we are dealing here with this same factor of brightness. The 'lovely bright colours' of the modernist contrast with the duller colours of the older masters; in a similar way the bright, sunlit photographs preferred by one group contrast with the dark, cloudy pictures liked by the other group. The statues created by Kolbe are bright and happy in the main—'schicksallos schön', as Carls says—while those created by Barlach are 'schicksalhaft betont'.

IV. RELATION TO TEMPERAMENTAL FACTORS

Whether this hypothesis be accepted or not, the reality of the 'K'-factor can hardly be doubted. In order to explore the psychological ramifications of this factor further, it was decided to correlate it with tests of temperamental and other qualities of psychological interest. But before proceeding to find the relation of the 'K'-factor to these qualities, it became necessary to construct a short, yet accurate, test of this factor. The five tests described above, suitably weighted, would of course constitute the best test available; but these tests take too much time, both in the giving of the test, and in the calculation of the results, to be used on a larger number of subjects.

Hence what will be called the 'K'-test was constructed. As the opposition between the two types of pictures which characterize this factor is most clearly manifested in the two landscape tests and the portraits test, only pictures from these tests were used in the 'K'-test. Altogether, one hundred pairs of pictures were chosen, in such a way that one of them exemplified the 'bright' or modern type of picture, the other the older type. These pairs were selected, wherever possible, so that the subject portrayed was more or less the same—a bridge, a mill, mother and child, and so on.

The pictures used were taken from the three tests described above, and also from several preliminary tests which showed essentially the same opposition between the two types. That this test measures much the same factor which appeared in the five original tests becomes clear when we correlate the score of the original fifteen subjects in the 'K'-test with their average saturations in the five tests. The correlation is 0·886, with a standard error of 0·06. The split-halves reliability of the test is 0·921 ± 0·03, for thirty subjects. Sixty-eight pictures out of the two hundred were portraits, one hundred and thirty-two were landscapes.

Groups of subjects of varying size (between thirty and fifteen in number) were given this test, and also one or more of the five tests described on the following pages, in order to find out something about the relations between the 'K'-factor and the other qualities tested. Each of these tests was thought on *a priori* grounds to be related in some way to the 'K'-factor.

(1) *Extraversion—introversion.* It is not a new idea that there may be a connexion between temperament and aesthetic preferences; such a connexion is posited for instance on experimental grounds by Burt (6), and on mainly theoretical grounds by Evans (7).

In this investigation, the Heidbreder test of introversion (8) was given to fifteen subjects; in addition each subject was judged by two independent judges with regard to the degree of extraversion or introversion he exhibited. There was fair agreement between the judgements and the results of the test, and a mean value was taken.

The correlation between extraversion and the '*K*'-factor is definitely significant, being 0·723, with a standard error of 0·13. The extravert tended to prefer the 'bright', modern type of picture, the introvert tended to prefer the older masters.

(2) *Radicalism—conservatism.* It is a matter of everyday observation that radicals in politics and morals also tend to be radical in their artistic preferences; we would not expect the socialist and the conservative to have similar views on the merits of Laurencin or Modigliani.

Accordingly Vetter's radicalism—conservatism test (9) was given to fifteen subjects; in addition each subject was judged by two independent judges with regard to the degree of radicalism or conservatism he exhibited. Again, there was fair agreement, and a mean value was taken between the ratings and the scores on the test.

The correlation between the '*K*'-factor and radicalism is almost exactly the same as that between extraversion and '*K*', namely, 0·721 ± 0·13. This correlation also is definitely significant.

(3) *Youth—old age.* Young people might be expected to prefer the 'bright' type of picture, while those of an earlier generation might be expected rather to prefer the older masters. This expectation is borne out when age is correlated with the results of the '*K*'-test; the correlation is 0·390, with a standard error of 0·16.

(4) *Preference for colour—preference for form.* It was considered likely that preference for colour might be correlated with high '*K*'-scores, and preference for form with low '*K*'-scores. In order to test this hypothesis, a test was constructed which in some ways is an elaboration of tests described by Feasey (10), Yokoyama (11), and Oeser (12).

The subjects in this test were required to rank in order of liking ten polygons (taken from Birkhoff's collection (13)), and also ten colours (taken from Ostwald's selection of coloured papers (14)). When they had done this, they were required to rank in order of liking ten coloured polygons, in which the colour and the form were combined in such a way that the best-liked colour was put with the worst-liked form, and vice versa. Thus a conflict was set up within the individual, and the way in which this conflict was resolved indicates which of the two characteristics—colour and form—had more influence on the subject's aesthetic preferences. (It was of course necessary for this test to prepare beforehand a set of the polygons cut out in each of the colours.)

This test correlated with the '*K*'-test to the extent of 0·323, with a standard error of 0·17. This correlation, although highly suggestive, cannot be regarded as statistically significant.

There is also a correlation of 0·472 ± 0·24 between the colour—form test and the extraversion—introversion test. This correlation, which is on the borderline of significance, would seem to suggest that further experimentation with this test might well be worth while; particularly so as positive results were obtained from other colour—form tests by Scholl (15), and Enke (16), and also by Rohrschach (17). A review of this work is given by Kretschmer ((18), pp. 190 *et seq.*).

(5) *Preference for bright colours—preference for subdued colours.* It has been suggested that in preferences for colours a bipolar factor becomes evident which divides those who prefer bright from those who prefer subdued colours (19). As it was thought that preference for bright colours might be related to preference for the 'modernist' aspect of the '*K*'-factor, a score was derived from the rankings of the ten colours used in the preceding experiment, which expresses in the form of a ratio the relative preference of each subject for the bright and the subdued colours.

This ratio, however, does not correlate significantly with '*K*'; the correlation is 0·182, with a standard error of the same size.

V. SUMMARY

We are now in a position to summarize the results of our investigation. We found that the same two factors were active in each of the five sets of pictures used. One of these factors was the '*T*'-factor, which was discussed in an earlier article. The other factor, '*K*', seemed to divide the population into two different 'types', one preferring the modern, the other the older style of painting. This factor, identified provisionally with 'brightness', correlated with extraversion, radicalism, youth, and possibly with preference for colour. The colour—form test also appeared to be correlated with extraversion. These results are definite enough to suggest that further research into the relation between temperament and aesthetic preferences will prove fruitful not only in extending our knowledge of the 'type' factors in aesthetic judgements, but also in increasing our understanding of temperamental 'types'.

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PUBLICATIONS RECENTLY RECEIVED

Child Expression in Colour and Form. By Hilda Walley Oldham. London: John Lane, The Bodley Head. 1940. Pp. 157. 9*s*. 6*d*. net.

This is a welcome addition to the literature that portrays the development of the child mind from babyhood to adolescence. Though the author is a mathematician as well as a psychologist, she gives no statistical treatment of the data she has gathered in preparation for the writing of her book, but treats them descriptively and always from the objective point of view, illustrating the conclusions she reaches by numerous drawings and some very beautiful coloured plates copied from the actual performances of the children whose work she studied. The lack of statistics in no way detracts from the value of the book; for we are reminded that statistics deal with data, and that these must always hold the first place. On the contrary, her method of treatment makes for a real popularization of psychology, since *Child Expression in Colour and Form* will appeal not only to professional psychologists, but also to all those who are interested in the gradual unfolding of child mentality, and wish to understand the way in which children of different ages look upon and interpret the objects of the world around them, how their perception of such objects alters as they mature, and how in the end they come to interpret them as adults do.

There are two particularly interesting chapters in the book, one on synaesthesia (followed by three other illustrative chapters showing the child's expression of odours, music and emotions in terms of colour and form) and the other on Child Symbolism and Surrealism. Dr Oldham speaks of associations, presumably contiguous associations formed in prior personal experience, as the cause of these synaesthesias; and where there is no fairly obvious reason for such a presumption, she has recourse to unconscious associations, and even associations due to racial inheritance, to account for them. Though most psychologists probably accept the association theory as accounting satisfactorily for the facts, there is another possible explanation of synaesthesia the author does not take into account which is possibly even more fundamental than this. The chapter on Child Symbolism begins: "The child draws what he knows, not what he sees"; and an amusing drawing by a child of six is that of a cat full of mice, one of which is seen in its gullet in the act of being swallowed: "so it is choking and bad breath is coming from its mouth because it has eaten too many mice." The child also paints an object as he wishes it might in fact be, like the little girl who painted coloured rain. It enjoys a sense of power by drawing what it pleases and giving it a name, as did the child of three who drew a line and called it a train, and then a shorter line which was "a nice pussy". These are indications, well worth studying, of the inner drives beneath the child's expressions of himself in his primitive art-play. They are objective keys which open the lock of the door that gives access to his mind.

Dr Oldham writes with insight and sincerity. Her book can be recommended to those who are concerned with psychology, education, art, and developmental theory.

F. A.

Educational Psychology. By Charles Judd. London: Geo. Allen and Unwin, Ltd. 1940. Pp. xx + 566. 18*s*. net.

This book is a product of ripe experience and prolonged and often profound study. It is nevertheless written in a straightforward, clear and simple manner which will be attractive to most readers, whether they start with any knowledge of the subjects dealt with, or are complete beginners. Professor Judd covers an immense field, for he considers educational psychology to be "the science which describes and explains the changes that take place in individuals as they pass through various stages of development from birth to maturity" and the applications of the results of this study to school procedure are only a part of a much wider discipline. Moreover, as he fully maintains in this book, his well-known keen interest in social determinants of education, a great many topics are dealt with which many exponents of "educational psychology" would regard as somewhat wide of the mark. In a sense the book seems to belong to older and more leisurely days, and while it is informed by a thorough knowledge of a mass of careful experimental work, it has comparatively little about tests and exceedingly little about statistics. This makes it all the better to read.

The Integration of the Personality. By CARL G. JUNG. London: Kegan Paul, Trench, Trubner and Co. Ltd. 1940. Pp. 313. 15*s.* net.

This book is in the main a restatement and development of the Jungian theory of the relationship of the conscious to the unconscious mind, and in particular a description of the various ways in which the unconscious may manifest itself. It is held that the personality can be fully developed only through the process of 'individuation', by which the phenomena of the unconscious mind are integrated into the totality of the ego. But this process, when extended from the personal to the collective unconscious, is fraught with danger, since the processes of the collective unconscious are so violent and so chaotic in their nature that they may come to dominate the ego altogether, the result being a psychosis. Thus only the exceptional individual will have the strength and understanding to undergo complete 'individuation'. In the past the less gifted individual was able to express and to deal with the unconscious in terms of myth, religion, magic or alchemy, all of which contain projections of the collective unconscious. But the rationalism and materialism of the last two centuries have bereft man of these outlets, and the repression of every mode of expression of the unconscious has at last resulted in general unrest, followed by an outburst of the libido in the insane violence which confronts us to-day.

Unfortunately, those who may have hoped for a clearer and more definite account of the Jungian theory of the unconscious will find this book disappointing, since its presentation is muddled and its expression far from clear. It consists of six lectures, two of which are devoted to studies of cases of 'individuation', one through unconsciously directed paintings, the other through dreams. (Incidentally, the latter provides a magnificent series of 'Jungian' dreams, but one which Dr Jung himself acknowledges to be of very unusual occurrence.) Another chapter deals with the projection of the unconscious in Alchemy. Two chapters describe the process of individuation, and the 'archetypes' of the collective unconscious. The final chapter raises considerable uneasiness in the reader's mind. If only the exceptional individual, the 'superman', is capable of a direct integration of the unconscious in the personality, how can the ordinary man deal with its disruptive functioning? Dr Jung, apparently basing his views on a rather superficial understanding of the potentialities, as against the actualities, of the Christian religion (especially of Protestantism), seems to dismiss the possibility of any help from that quarter. Is the ordinary man, then, to be surrendered without hope of release to the domination of the 'superman'? One is forced to conclude sadly that Dr Jung is giving a dangerous support to the cult of the Fuhrer and its fallacies.

M. D. V.

Man and Society. By KARL MANNHEIM. London: Kegan Paul, Trench, Trubner and Co. Ltd. 1940. Pp. xxii+469. 16*s.* 6*d.* net.

This book was first published in German under the title of ***Mensch und Gesellschaft im Zeitalter des Umbaus.*** It has, however, according to the author, been very extensively rewritten and extended. The basic idea is that the present is an age of reconstruction; that to search the past for values, whether of social functions or of social structure is somewhat futile, and that the fundamental ideas upon which an effective and desirable society is based have to change radically as the scope and structure of that society change. In a general way what the author is trying to do is to find a way of synthesising freedom with planning so that both may find the fullest possible expression in social life. The argument is intricate, long, very learned, with masses of foot-notes and a wealthy bibliography. Contemporary changes have been so rapid that already many things in the book seem, for the time being, out of date; but that is certainly not Dr Mannheim's fault. Although the volume is the sincere expression of a mind both vigorous and contemplative, it is apt to treat 'planning' as a sort of slogan, a sort of word which wins large approval whether or not its precise implications are fully understood. It is tolerably easy to say that ways must be found to combine democratic forms of authority with the control which social planning implies, but most of the urgent practical problems concern perhaps less the forces that are in operation in society than the time limits within which those forces can be brought into effective operation. And the times of change are much less fully understood than the principles and sources of change.

The Plans of Men. By LEONARD W. DOBB. Published for the Institute of Human Relations, by Yale University Press. London: Humphrey Milford. 1940. Pp. xiii+411. 18*s*. 6*d*. net.

While this book concerns directly only American social life and its authorities are almost entirely American authorities, it will nevertheless be found of very great interest and significance by many readers in this country. Dr Dobb is already well known here for his study of propaganda, and it is likely that this book will enhance his reputation. It is true that the greater part of it is written in a very general style of reference, and there is far more about the principles of human social planning and about illustrations in America of the application of these principles, than of any attempt to get any definitive and experimental determination of how far and in what directions planning of this kind can expect to be successful. But in this general manner the volume represents a genuinely important contribution to a topic which is now exciting lively interest in all countries. After a discussion of the nature of planning, the author passes in review various important departments of human activity in which planned programmes appear to be desired. In this way he considers biological, social, political, economic and psychological activities, and adds a little about the values that are inherent in planning. He then considers how planning in his sense of the term is actually being developed—still mainly in U.S.A.—and illustrates with discussion planning for the individual, for social life, for economic development, for political change, and that type of plan which has come to be called 'regional'. His final section is called "perplexing problems", and here he considers ability to plan, the need for planning and how to plan for the immediate future. Many students would beyond a doubt have preferred a somewhat more concise style of exposition, and a volume willing to take a bit more risk about concrete affairs. But as a statement of principles and movements which are bound to become of increasing importance, the book is one which deserves to be well known and widely discussed.

Population, Race and Eugenics. By MORRIS SIEGEL. Hamilton, Ontario: Published by the Author. 1939. Pp. x+206. $3.00.

This useful essay is very largely practical in its aim. There are four main parts to the book. The first is called Practical Eugenics. It is chiefly concerned with what may be done in a constructive manner to maintain and improve the human stock. It states fairly the facts, so far as they are known and can be briefly summarized, with regard to the declining populations of the more cultivated classes and makes practical suggestions which are both moderate and sensible. The second part is called Race Theories in Relation to Eugenics. This is highly condensed and is rather slight and jerky. The author is critical of race dogmatisms, but states briefly the main classifications which have been proposed on this basis. The next part is entitled Rational Marriage. Here the author argues that society should see to it that as far as possible eugenic considerations should play their part in all marriage contracts. The final part deals with Restrictive Eugenics and tackles the problems of feeble-mindedness, of mental disorders of a functional nature and of epilepsy. The author suggests methods of dealing with all these problems and is throughout moderate but definite in his views. The essay is a very good one, clear, definite and positive. While it cannot lay any particular claim to originality either of thought or of treatment, it gives a responsible survey in brief of its whole subject matter.

Human Nature Writ Large. By F. CREEDY. Foreword by BRONISLAW MALINOWSKI. London: George Allen and Unwin, Ltd. 1939. Pp. 484. 15*s*. net.

The subtitle "A Social Psychologic Survey and Western Anthropology", is perhaps regarded as explaining the title, but neither is particularly clear. Mr Creedy is convinced that there are various "primal psychologic urges" (equally well called "Absolute Values") which it is somehow or another the purpose of society to realize. He tentatively selects as the most important of these: self-preservation, reproduction, co-operation with others, and creative intellectual activity. If these can be realized in a process of steady change all is well; but they cannot, for some of them are 'animal', and as soon as any mode of conduct has been achieved these stiffen such a mode into unyielding habit which fails to satisfy the demands of reason. Then society develops myths of one sort or another which purport to rationalize these fixities of action, and add their influence to the hampering effect of animal habits upon creative effort. From this situation arise the fundamental conflicts of primitive and modern society, and the main theme of the book is to illustrate and, within the limits of its general scheme, to explain all the main conflicts of Western civilization, whether in religion, in national organization, in science, in art, literature and metaphysics, or in economics. It will be seen that Mr Creedy casts an extremely wide net, and he succeeds in bringing up a good many catches that are worth studying. But the book suffers by attempting to cover too much ground. It is better to dip into than to read right through. In spite of Professor Malinowski's extremely glowing introduction the author does not show any very comprehensive knowledge of current social psychology. It would perhaps have been better if he had written a little less at large, and given a cleaner and clearer account of why in some particular realm the human mind proceeds by a process of myth-making and myth-breaking.

Suicide. A Social and Historical Study. By ROMILLY FEDDEN. London: Peter Davis, Ltd. 1938. Pp. 351. 12*s*. 6*d*. net.

The subject may be a gloomy one, but the writing is anything but depressing. It is rather curious that while a very considerable number of elaborate works about suicide have been written by French and German authors, very little systematic attention has been given to the subject by English writers. While Mr Fedden's general line of approach is historical, so that he recounts with spirit many stories of famous and infamous individual suicides and gives a reasonable amount of attention to social influences and movements which have produced various forms and frequencies of self-murder, he also writes very clearly and judiciously about the main motives for suicide. He even, in a final chapter, gives some, but not too many, statistics. The result is a book very interesting to read and not in the least morbid. Mr Fedden treats psychologists who have written extremely seriously about this topic with most excellent light-hearted respect and has many acute remarks to make about their theories. Altogether this is a most stimulating and interesting book, and better than a good many far more pretentious treatises dealing with this melancholy subject.

Psychomental Complex of the Tungus. By S. M. SHIROKOGOROFF. London: Kegan Paul, Trench, Trubner and Co., Ltd. 1935. Pp. xvi + 469.

In this volume the author sets himself the task of presenting the psychomental aspects of Tungus culture as one of three types of ethnographic phenomena, the other two being material culture and social organization. According to Shirokogoroff the psychomental complex consists of psychic and mental reactions to the milieu, in other words, attitudes and ideas. The psychic elements he thinks of as more permanent and definite than the mental elements. The exposition is divided up under the heads of (1) positive knowledge, (2) hypotheses, and (3) their practical consequences. Because of the vastness of the material, Shamanism, which really belongs under (3), is given a separate division.

Although the author seems to know the terminology of recent psychology and discusses various methodological and observational pitfalls of ethnographic investigation, the reader who is interested in the social psychological aspects of the Tungus people will be greatly disappointed with this massive folio because of its unsatisfactory psychological background. The dubious quality of the psychic and the mental is hardly justified in the text. Despite the author's constant reference to scientific objectivity and his original definitions, he treats psychomental complexes of groups as persistent entities. Not even the specific repudiation of such a conception in his conclusion alters the tenor of the whole treatise. Again, the author finds no incongruity in his acceptance of the idea that a psychomental complex is a system of conditioned reflexes and his belief that Shamans can actually read thoughts and communicate with others at a distance. J. R. K.

How Life Began. By DAVID FORSYTH. London: William Heineman (Medical Books). 1939. Pp. xi+106. 5*s*.

The author rightly calls his essay "A Speculative Study in Modern Biology". It is original, intensely interesting and stimulating. The argument is already so condensed that it cannot properly be further summarized without loss. In general the view is that "biological life is a universal phenomenon...a manifestation of the whole world's surface". It is all one physical-chemical process with the development of any form of organized matter, though in its biological form it is specifically connected with solar radiation. In its developments towards greater and greater specialization it is a consistent application of a Principle of the Economy of Energy. Stated in this very bald manner the essay may appear to be nothing but sheer abstract theorizing, but it is a good deal more than that. As all readers of this *Journal* are likely to know, the author is a competent and skilled biologist, and no matter how radical or how general his views may appear he is ready with illustrations and instances. Most of the views expressed in this essay could be made the basis of prolonged argument, and perhaps the issues raised would at present still remain undecided. But the author is to be congratulated on a provocative and well stated piece of work.

A Psychologist's War-time Diary. By ANTHONY WEYMOUTH. London: Longmans, Green and Co. 1940. Pp. 300. 12*s*. 6*d*. net.

The diary begins on Friday, 1 September 1939 and finishes on Thursday, 29 February 1940. Its main interest lies, not in its comments on the War or the war situation, or in its remarks about Hitler, Mussolini and other people at a distance. At least this is not its main interest to-day, though possibly it may be at some time later; for all these comments are much the same as were made by a very large number of other people, and to the contemporary reader they will seem all too familiar. The main interest of the book at the moment is the large amount of material recounting personal contacts and impressions with various very much less disastrous people who have during this period, largely under the care of the author, taken part in B.B.C. activities. In this respect the book is admirable, and should provide both amusement and relief to a large number of readers, whether these are psychologists or not. When Mr Weymouth impinges upon academic psychology he has nothing impressive to say, but when he forgets the books and writes after the style of a combination of the doctor-novelist he is generally full of interest and sometimes achieves unusual insight.

Extra-Sensory Perception After Sixty Years. By J. G. Pratt, J. B. Rhine, B. M. Smith, C. E. Stuart and J. A. Greenwood. New York: Henry Holt and Co. 1940. Pp. xiv+463.

The study of Extra-Sensory Perception has gained a definite foothold in the general field of Psychology in the past few years. The clouds of the battle which ensued after the publication of Rhine's original monograph have lifted sufficiently for an appraisal of the results reached to date to be made with some hope of impartiality. This is attempted here by a team of workers from Duke University. They have assembled results from the mass of experimental investigations in this field over the past sixty years, and made an effort to separate the wheat from the chaff. In order to do this, they have summarized all the serious criticisms levelled against ESP under thirty-five headings, and then examined each research to see whether it could be invalidated by these criticisms jointly or separately. Although a large number fall by the way, sufficient results are left untouched by criticisms yet brought forward for the reader to conclude that it is no longer possible to doubt the occurrence of ESP on rational grounds. This conclusion is strengthened by the fact that the President of the Institute of Mathematical Statistics has endorsed the statistical methods used by Rhine and his fellow workers, while the American Psychological Association went a long way towards endorsing their experimental methods. Ten of the most noted critics of ESP, whose opinions on the book were canvassed by the authors in order to present the other side of the picture also, mostly deal with minor points in their comments, and complete agreement does not seem such a forlorn hope now as it did once.

If the part of the book dealing with the occurrence of ESP leads to very positive conclusions, and presents a hopeful outlook for the future, that dealing with the nature of ESP is mainly negative. Several hypotheses are ruled out, but there seem to be no others to take their place. Clearly this position cannot be allowed to continue, and the programme of research outlined by the authors promises that a definite breach will soon be made in the stone wall that confronts us at the present.

The book has been carefully prepared and attractively produced, and is obviously destined to become the textbook for all those who are interested in this field of study. The bibliography is invaluable, as are the summary of criticisms and the many tables dealing with results of researches to date. Some readers may object at having to read through twenty-five pages of statistics right at the beginning of the book, pages unintelligible to the non-mathematical and for the most part familiar to the initiated. This section might with advantage have been relegated to an appendix, although as it is the twenty-one appendices provided slightly overload the task of the conscientious reader. In spite of these very minor points to which exception might be taken, the book is eminently readable, and what is more important, reliable and trustworthy.

H. J. E.

Vowel Sounds in Poetry: Their Music and Tone-Colour. By M. M. Macdermott. Psyche Monographs, No. 13. London: Kegan Paul, Trench, Trubner and Co., Ltd. 1940. Pp. 148. 5*s*.

BRITISH PSYCHOLOGICAL SOCIETY

REVENUE ACCOUNT AND BALANCE SHEET AS AT 30 SEPTEMBER 1940

Revenue Account for the year ended 30 September 1940

1939 £ s. d.	EXPENDITURE	£ s. d.	£ s. d.
130 0 0	*To* Rent, 55 Russell Square		130 0 0
	Use of Room for Office		17 6 8
25 11 11	Caretaker		
7 19 9	Lighting and Heating		2 9 8
252 0 0	Secretary's Salary		252 0 0
16 0 9	Part-time Assistance		
109 16 7	Printing and Duplicating		73 1 3
25 11 0	Expenses of Meetings		16 5 2
79 8 8	Postages and Telephone		54 10 8
18 6 0	Stationery		21 5 3
4 12 0	Insurance		4 12 0
4 14 6	Subscriptions to outside Associations		3 8 3
10 10 0	Audit Fee 1939		10 10 0
14 15 6	Teas		2 6 1
5 11 5	Sundry Expenses		2 15 7
	Journals Publication Expenses:		
234 2 7	General	225 13 6	
130 6 6	Medical		
98 12 6	Educational	94 14 6	
463 1 7			320 8 0
9 10 7	Extended General Meeting 1940 ...		15 3 8
1 15 11	Committee on Human Mental Measurements		
2 11 8	Midland Branch Expenses		1 9 9
1 5 0	Northern Branch Expenses ...		
8 12 5	Scottish Branch Expenses		7 19 7
1 0 0	Cheque Books		1 0 0
	Removal of Library to Nottingham		42 18 1
	Legal Expenses *re* Premises ..		13 5 0
	Legal Expenses *re* Incorporation—On account		75 0 0
	Depreciation:		
	Library	62 6 7	
79 10 9	Office Furniture and Fittings ...	23 6 6	85 13 1
1322 6 0			1153 7 9
176 13 10	Balance, being Surplus of Income over Expenditure		269 1 7
£1498 19 10			£1422 9 4

1939 £ s. d.	INCOME	£ s. d.	£ s. d.
	By Subscriptions 1940	1487 6 0	
	Subscriptions 1939	3 8 0	
		1490 14 0	
	Less Resignations and Removals ...	206 12 0	
1371 17 6			1284 2 0
127 2 4	Interest on Investments		125 4 10
	Recovery of Income Tax		13 2 6
£1498 19 10			£1422 9 4

Balance Sheet as at 30 September 1940

1939 £ s. d.	LIABILITIES	£ s. d.	£ s. d.
	Rent receivable in Advance		12 10 0
2 2 0	Subscriptions in Advance		
	Publications Reserve:		
122 0 0	Balance as per last Balance Sheet ...		122 0 0
	Revenue Account:		
	Balance as per last Balance Sheet ...	5082 18 11	
5082 18 11	*Add* Surplus of year	269 1 7	5352 0 6
£5207 0 11			£5486 10 6

1939 £ s. d.	ASSETS	£ s. d.	£ s. d.
274 15 7	Cash at Barclays Bank Ltd.		498 17 10
1 19 1	Postage Stamps in hand		1 12 2
	Investments at Cost.		
	£300 5% Conversion Loan 1944–64...	318 9 9	
3743 17 6	£3320. 14*s.* 8*d.* 3½% Inscribed War Loan	3425 7 9	3743 17 6
	Note: Market value of above Securities at 30 September 1940, £3694		
	Rent, 55 Russell Square, paid in Advance		45 0 0
27 13 4	Sundry Debtors...		1 3 7
183 0 0	Subscriptions in Arrear		244 4 6
	Office Furniture and Fittings:		
	Balance as per last Balance Sheet ...	158 0 0	
	Add cost of Library Shelving at Nottingham	75 5 0	
		233 5 0	
158 0 0	*Less* Depreciation	23 6 6	209 18 6
	Library		
	Balance as per last Balance Sheet ...	557 10 0	
	Add Expenditure during year ...	65 19 7	
		623 9 7	
557 10 0	*Less* Depreciation	62 6 7	561 3 0
	Monograph Publications:		
	Balance as per last Balance Sheet ...	210 5 5	
210 5 5	*Less* Amounts repaid during year ...	79 12 0	130 13 5
50 0 0	Shares in the British Journal of Educational Psychology Ltd., at Cost ...		50 0 0
£5207 0 11			£5486 10 6

I beg to report that I have examined the foregoing Accounts with the Books and vouchers of the British Psychological Society and that I have obtained all the information and explanations I have required. In my opinion the Balance Sheet is properly drawn up so as to exhibit a true and correct view of the state of the Society's affairs according to the best of my information and the explanations given to me and as shown by the Books of the Society. The Securities appearing under the heading Investments have been verified by production of the Bankers' Certificate.

T. BARRETT,
Incorporated Accountant

S. J. F. PHILPOTT
Hon. Treasurer

25 *November* 1940.

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ASPECTS OF THE PSYCHOLOGY OF GAMES AND SPORTS[1]

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I. INTRODUCTION

THE psychology of games and sports is a subject of very great interest, which has been dealt with by a number of writers, but which has never received the treatment it deserves at the hands of social psychologists. It has been treated by psychologists chiefly from the points of view of the psychology of morals and of education, and as a branch of the study of play. Group games and sports, however, have a very special interest for the social psychologist in a variety of ways, and it is the purpose of this article to point out some of these ways in a simple manner, though of course they cannot be dealt with fully here.

The whole subject can be profitably approached from three points of view: (*a*) the study of the individual and of his attitudes and interests and of the gratifications he receives from sports; (*b*) the study of the groups involved and represented in sports, and of their animosities and friendly feelings towards each other; (*c*) the study of the influence of tradition and of the social background upon all groups and individuals concerned in games and sports.

These three aspects are not strictly separate, but are interwoven in a variety of ways and will not be treated separately here. The individual it is who takes part in sports and games, but always in a social way—and, from the psychologist's point of view, it is still a social interest on his part even if he exhibits anti-social behaviour, because to be anti-social is simply one kind of social response. The number of games which can be played by individuals alone, like patience and golf, is small, and in them it is usually assumed that there is an imaginary opponent. In golf 'bogey' is a sort of standard imaginary opponent, who is available for any player who cannot find a playmate in flesh and blood. Indeed, in psychology, we should be inclined to say that absolutely non-social sports are almost unknown. It is perhaps necessary to say 'almost', but the word is introduced chiefly to guard against the possibility of appearing unduly dogmatic. When an animal, a child or adult plays with any objects, animate or inanimate, with objects of imagination or with himself, he is really using these objects as substitutes for the inner and often unconscious objects of his own fantasy life, and these seem always to have social meaning of some kind. Thus solitary play often has much social significance to the individual, but in the study of group games and sports we must take serious account of the degree to which such games tend to bring individuals together and make them co-operate in joint constructive efforts. In this way group games like cricket and football seem to do most, and the solitary games least, and the group games have rightly become important parts of public life. It would be silly to take an excessively practical-minded point of view, and to say that these group games are a waste of time which should be put to 'real' use. To the psychologist they are obviously a most important part of everyday life.

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[1] Based on an address to the Oldham Council for Mental Health, in March 1939, and to the Psychology Students of the Workers' Educational Association in Glasgow, May 1939. I am indebted to Dr E. H. Connell for his help and especially for his insistence that the symbolic meanings of games to the individual and the problems of territorial combat should be discussed.

Before discussing the psychology of group games it would be interesting to describe a cricket match in which I recently took part. There was some time to spare on the annual outing of the staff of a small factory. They were at a convenient village green in the New Forest, with houses on one side and gorse bushes on the other. Soon cricket bats, wickets, bails and a ball were produced out of a bag, and the green became—once again in its history—a cricket pitch. Sides were rapidly chosen, and soon a match was in progress between the 'English' and the 'Australians'. Everybody took part in this game, even the coach driver, and their ages ranged from fifteen to seventy-five, while their occupations varied from office boy to managing director. It was assumed that everybody could play cricket, and one woman, who had never before handled a bat, triumphantly carried it off the field, not out, when her side retired. The pitch was sporting to say the least of it, and doubts about the direction in which a ball would bounce added to the fun. There were houses across the road near by, but it was understood that the object of play was to have a good game and not to break windows, so batsmen avoided hitting the ball in that direction. Once, however, when it did go into the road, it landed in a passing motor car, and the occupants good-humouredly returned it. Probably they wished they were playing cricket too. Sometimes the ball was lost in the gorse, but then everybody joined in the search. Some of the fielders had to keep out of danger three cows, some geese and two dogs who regarded the green as belonging to them exclusively. A game of this kind has strong claims to be called the 'real' cricket, and, in its socially constructive and fraternal qualities, and in its good-humour, it illustrates the fundamental aspects of group games.

II. CONSTRUCTIVE USE OF AGGRESSION

In social psychology we cannot suppose that there is any possibility of producing an idealistically moral individual. This is an illusion of the schoolmaster, the parson and the moral philosopher. The psychologist is an uncompromising realist. He knows that the solution of moral problems lies ultimately in the production of harmoniously developed individuals and of harmoniously organized groups, but he does not think this solution can be found by idealistic purifications. He thinks, on the contrary, that a harmonious society will have to find some definite satisfactions for the individual's aggressive, destructive and sexual impulses. It will have to recognize the existence of these impulses in man, and to find a place for them in its culture and social order. It is of no use to think of these impulses as dirty, dangerous or immoral: they must be viewed with simple acceptance as normal to our existence. The problem before the social psychologist is to find a place for aggression and destruction in which they will not conflict with the harmony of individual and society. To do this it may be necessary to have a complete moral revolution in the end, but social and individual harmonies will not be found by idealistic purifications.

One of the greatest interests of group games and sports to the social psychologist lies in their capacity to sublimate individual and group aggression. By this we mean simply that they find outlets for impulses which might endanger the harmony of social groups, and that they allow individuals to express, in a constructive way, impulses which might otherwise be socially repressed and prohibited. We may say that group games have what Aristotle called a cathartic action in connexion with tragedy. We must, however, not be content with thinking that games are simply outlets for unwanted energy. That mistake is too often made, just as some people are inclined to defend or excuse prostitution as an outlet for unwanted sexual energy. This is not a sound psychological explanation or excuse for prostitution, however, because the love represented by this sexual energy is very much wanted, and prostitution exists because, for a variety of complex psychological reasons, the people who want it cannot get it. We must look on the aggression which finds outlet in group games as decidedly wanted by society, and one great interest of these games is that this energy is used in them in socially constructive ways. It has given us, for instance, the world-wide organization of Association Football—an addition to human social life of very great value and importance. This is to be contrasted with some other ways in which aggressive energy is used, such as competitive trade and warfare. In these, though the resulting social organizations are useful to some groups, they tend to set up conflict with other groups in a dangerous and destructive rivalry, whereas in group games we are friends, not enemies, because we compete. Group games cannot of themselves do all the social psychologist asks, and we must not make the mistake of being converted to a single faith which we believe to hold the solution of all possible problems; but such games are of great interest because they show us the constructive use of aggressive and destructive impulses in group and individual.

III. MEANINGS OF GAMES TO THE INDIVIDUAL

We may turn now to some more detailed meanings of group games to the individual. Some sports, like wrestling and boxing, are not dependent on special weapons apart from the individual's limbs and fists, and in most games to-day we do not kill our opponents, though in past times this has frequently occurred, as in jousting. In some sports, such as shooting, we are given dangerous weapons in addition to our limbs and fists; and in fishing, hunting and shooting we are expected to kill and even sometimes to eat the trout, stag, pheasant or other enemy creature. In chess and card games we play with symbolic men rather than with weapons, and allow them symbolic deaths and forms of conventionalized capture. There is great variety in all these ways in games and sports, and there can be little doubt that a given individual tends to excel in the game or games which fulfil the particular requirements for gratification of his own special fantasies and attitudes to the greatest degree. It is the same in the plastic arts and music. Dabbling with water-colours suits one person, smearing oils another; manipulating clay or hammering stone suits a third. One musician likes to nip the reed of the oboe, another likes to blow into the flute; a third prefers to pound the piano or to whine on the saxophone.

We cannot believe that games and sports, in all their varieties, have been deliberately planned, according to intellectual and rational rules. They have grown up and varied from each other because different individuals needed different forms of gratification in play, and imaginations tended to construct games which would satisfy them. For example, in golf and cricket the ball is struck with a club or bat. I often point out to my students that the teed ball, whose head is so skilfully and violently cut off with the driver, may be unconsciously much more than a mere ball to the golfer. It is in one of its aspects a kind of enemy. Sometimes it seems to represent his office boy, his employer or even his wife or mother-in-law. When he is particularly savage and hits it so that he breaks his club and spoils his game, we suspect that it represents himself. A man to whom the ball always tends to represent his own person being punished by himself will never be a success at golf.

In football we have the same sort of problem. The 'rugger' player seems to have an especial liking for the ball, and wants very much to have the satisfaction of hugging it and possessing it to the exclusion of the enemy. Handling the ball is evidently one of the great joys of the game. On the other hand, in 'soccer', the player seems afraid that he will dirty or endanger himself by touching the ball with his hands. It is strictly taboo to touch the ball when it is alive or in play. Only privileged persons, the goalkeepers, are allowed to touch it, and then under special conditions, without being said to commit a foul act. To the psychologist it seems that the rules and prohibitions of these games have developed in order to enable the individual to do what his unconscious impulses demand of him. If a man has strong likings for possessing and hugging a ball-shaped object, he is more likely to fall in love with 'rugger'; if he has unconscious fears of ball-like objects, and intense desires to spurn them with his feet or to use them as weapons of attack, he may fall in love with 'soccer'. It is not likely that handlers and non-handlers will ever be satisfied with a compromise, because the unconscious meanings of the ball are too widely different for them. They are not playing out the same fantasy game: their unconscious fantasies are as different as those of communists and fascists, though their methods may be similar.

It seems, then, that there must be a wide variety of games, as wide a variety as there are differences between the deep fantasies expressed in play by a great variety of people, and to decry one game or praise another is often to do no more than to fight over unconscious preferences which are as real in one person as in another. Each person should be encouraged to choose the game most suited to him. It is a mistake for a school to play 'rugger' and to despise 'soccer'. All schools should play both games, and there should be no social credit attached to one and denied to the other.

To the individual who is playing a game, the opponent, the ball, the club or bat if used, the goal, the field of play and the members of his own side, are all symbolic actors, animate or inanimate, in his unconscious fantasies, and his gratifications are found in manipulating, controlling and acting with or against them. They are like the members of an orchestra to the conductor, who summons with his baton first one and then another of these devils or angels of his fantasies to play his part in the music which he is interpreting. It is often said that competition is the essence of sports and games; but it is no more fundamental to them than to life in general. The particularly interesting feature of games is their capacity to make friends rather than enemies out of opponents and rivals.

IV. TERRITORIAL INTERESTS OF GAMES

If we turn from the gratifications of the individual to the interests of the group, the first and most obvious feature of games like football is their territorial meaning. Territorial interests are widespread and deeply rooted in the lives of members of the animal kingdom (1). A large number of different kinds of birds and mammals tend to seize territory, either in pairs or in groups, and to put it to use for nesting and hunting purposes. Since many creatures, from fish to apes, are biologically dependent for food and shelter on the possession of territory, it is not surprising that possessive attitudes to territory are strongly expressed in their instinctive tendencies. In Glasgow I knew a pair of brown owls which inhabited a small fir tree for years, and it was said that they had lived there for twenty years at least. It was a sunny place in a secluded garden, where they found shelter from the North and East winds and could not easily be seen. It gave them command over the food supplies of the neighbouring gardens at night. In man possessive attitudes to territory are also strongly expressed. Most people will feel it strange when they hear of land which is not owned by somebody, and, in the days when mariners could still find lands apparently not owned by members of their own peoples, they usually took immediate possession of them. Our laws provide elaborate systems for the ownership and partition of property, and land is one of the most significant emotionally, though not always the most valuable in money terms, among the different kinds of property.

To the psychologist the sight of two teams of footballers fighting a symbolical battle over the respective halves of a football ground is like a fight for the possession of territory. The game is to enter the opponents' country and to carry or to kick or head the ball, which is the weapon and the symbol of potency and mastery, right into their goal, which is like the very doorway of their stronghold. The side which can do this most often in the prescribed time and under the prescribed rules and laws of play is the winner—they have conquered the opponents' territory. The great importance of the off-side problem in 'soccer' emphasizes the territorial aspects of the game, because it is a problem about how and when a player can be said to have an unfair territorial advantage. The same kind of territorial symbolism finds its way also into other games, such as golf, where the player who can lodge his ball in the final hole, after making it take the smaller number of leaps across the intervening territory, is the winner. It is also found in cricket, where the enemy is sent chasing the symbol of potency across the field, while the batsmen run for possession of territory as often as they can from one wicket to the other.

The influence of territorial combat, especially in 'soccer', is reflected in the vast interest of international contests. When England plays Scotland it is like one of the historical battles fought over again, and it is often found that the home team is the more inspired, defending its own soil, and more often wins. Territorial ideas spread to the audience too, and in the great Glasgow grounds, for instance, Hampden, Ibrox or Parkhead, it makes a difference if one has found one's way into the wrong side of the auditorium, and falls into the hands of the enemy. Two friends of mine made this mistake one afternoon at Parkhead and, when they saw another man who had made the same mistake being helped out by the police, they kept very quiet. It must be said that social psychologists look upon the spread of organized international sports and games with the greatest possible satisfaction. They believe that a very large number of human territorial and other battles could be fought out harmlessly and constructively in the form of games.

V. FAIR PLAY AND *MORALE*

From this brief discussion of the less conventional aspects of the psychology of games, we must turn to the problems of fair play. These problems may be put in the following form: the individual, who is known to the psychologist to have intense aggressive and destructive as well as friendly and comradely impulses, is able to forego the pleasure of killing and maiming his opponents, and generally tries to avoid hurting them altogether, while he retains a keen interest in competition with them. He also sinks his own individual self-seeking tendencies to a great extent in supporting the interests of his side or team, and members of both teams, opponents though they are, co-operate to give the audience a good game to watch and enjoy. This remarkable degree of co-operation is perhaps found in group games more than anywhere else. It is not the result of deliberate or rational intentions. On the contrary, the rules and regulations were invented because they fulfilled a public desire for constructive games, and by itself no amount of pure moralizing could make a very anti-social person take a co-operative part in group games. It is necessary for him to come to feel the impulses of fair play for himself, and these do not arise from conscious moral endeavour. Underlying this is the same essential principle which makes occupational therapy so important in psychiatry.

The impulses of fair play seem to be fundamental to games and sports. Even in grouse shooting most sportsmen feel a certain desire to give the birds a fair chance; they want the hunt to be something like a fair rivalry and not a mere slaughter. In organized group games the players and the audience must all feel these impulses, (*a*) of fairness to the opponent and (*b*) of co-operation with their own side, very strongly, or else no amount of authority could ensure the success of games. For example, The Football Association Rules and Laws, and the capacity of the Association to enforce them, are both no more than the indirect expressions of public desire for fair games. The players and the public do not always get fair play, of course, but the desire for it is strong enough to make it the rule rather than the exception.

Fair play, *morale* and *esprit de corps* are inner controlling tendencies in the individual, which arise from his loyalty to group and leader, and make him reluctant to release his aggressive and destructive impulses to their full extent. In their place we find the skill of the athlete and his readiness to give up individual mastery and to take an interest in the group he represents, and even to treat the opponent as a friend. Fair play is probably to be regarded as made up of a combination in the individual of (*a*) comradely feelings towards other people, (*b*) strong unconscious tendencies to compensate for aggressive impulses which are also excited by his relations to others, and (*c*) each individual's own desire not to earn the hatred of the others by being the first to give way to those same aggressive impulses. It is this particular combination of tendencies which gives fair play its capacity to make group games into constructive outlets for aggression. It cannot be achieved by conscious moral effort, but only by more or less unconscious acceptance of group influences, which include even a sort of emotional identification with the opponent which prevents the combat sinking to a brutal level. It is probable that this capacity for fellow-feeling with an opponent is a very important aspect of human social psychology.

The psychology of fair play and the *morale* of group games have been clearly discussed by other writers (2, 6). Fair play seems to depend to a very large extent on impulses of comradeship which are deeply rooted in human nature. They are different from assertive and submissive impulses, and may, as Suttie has pointed out (9), be fundamental in all harmonious human relationships. They do not find expression very freely in our aggressive and competitive cultural environment. The *morale* of group games depends on submission of individuals in a team to leadership and to the purpose of the group apart from that of any individual taken singly. It is not a 'moral' or 'voluntary' submission, but comes from the formation of a new social pattern in the group, of which the individuals are components, but which is more than the sum of their independent wills. In the same way, two opposed teams which play well tend to form an even larger unit, and are, as pointed out by Rimet (8), more than mere opponents.

In group games, however, aggressive and acquisitive impulses, and sexual rivalry, are very strongly excited and find expression and satisfaction. The strength of these impulses is shown in outbursts of animosity between rival crowds of football enthusiasts, in violent expressions of support for their side by onlookers and their rude assertions of what they would do to their opponents if they had the chance, and also by the occurrence of 'accidents' which may often be unconsciously motivated when not due to deliberate foul play. The individual seeks expression of these impulses, but is, in general, consciously or unconsciously afraid of their strength and violence in himself. He therefore seeks more or less wittingly also for group-control and self-mastery. Another impulse, which strongly influences the behaviour of the individual member of a group which is held together largely by *morale* and *esprit de corps* is the fear of being the first to incur the hatred of the other members by an open expression of the tendency against which all are striving in the group. Here the anger of the other members would be incurred by open aggression against the symbolic enemy—the other team. In many groups, especially in war-time, panic is the tendency which is taboo and which would incur anger if expressed (cf. Rickman (7), p. 372). It is the combination of comradeship, and of loyalty to the group and leader, with the double desire for both expression and control of violent impulses in the individual, which gives rise to the impulses of fair play and the *morale* of group games. Fair play is an unconscious recompense to opponents for the aggression and sexual rivalry, and for the acquisitive impulses which a player feels in himself to be latent but directed against them in competitive games.[1] It strongly reinforces the original feelings of comradeship. The historical account (5) shows that the impulses of fair play have had a tremendous influence on the history and development of Association Football.

VI. PROFESSIONALISM AND BETTING

It is interesting to consider the relationships of professionalism and of betting to the fair play of games and sports, because both have sometimes been accused of threatening it. We have been told that a man cannot adopt the professional attitude and also continue to take part in games with the freedom from the influence of ulterior motives which they demand; and that an enthusiasm for betting may also provide incentives which would sometimes upset the sportsman's *morale* and *esprit de corps*.

In the Church a minister is generally expected to give his best service, and wants to do this himself. A man cannot easily give his best time and energy to the Church and earn a living elsewhere. Consequently for the most part ministers have to be professionals. For the same reason artists, musicians, athletes, psychologists and a host of other people have to be professionals too. In fact, everybody ought to be a professional at his particular job, but this should be no reason why a man who wishes should not also be a non-professional at other jobs. The difficulty is that the non-professional can never expect to reach the level of attainment reached by the professional, and this should not be expected of him. It is fair to expect every individual to wish to take up some occupation which will seem worth while to him because it satisfies his particular interests and utilizes his gifts, and which will at the same time make him self-supporting in the community. It is as sensible for a footballer as for a parson to be a professional. In athletics difficult problems will always centre about the definitions of amateur and professional status, and about the formulation and interpretation of rules and regulations connected with these definitions.

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[1] In the same way politeness in everyday life is often a more or less unconscious cover for hatred or jealousy; and the perfection of beauty traditionally demanded in works of art is often an unconscious recompense or restitution for aggressive and destructive impulses felt towards the objects drawn or symbolized (4).

With regard to betting there are greater difficulties. A man does not take up betting in order to make himself self-supporting in the community, unless he becomes a bookmaker. The psychologist, on the whole, thinks of the interest in gambling and betting as symptomatic of frustrations resulting from various complicated aspects of social life. It is a different question to what extent these interests are to be regarded as morbid or as normal, and a further difficult question how far they are essential to games and sports. In the more morbid forms of betting the bettor seems to be playing with the chances that he will receive a gift from fate which will suddenly compensate him for frustrations and losses which he feels, rightly or wrongly, that he has sustained at the hands of his family and fellow-men. Sometimes this may be a pathological obsession; at other times it tends to be disguised under other names and becomes his business. It is usually not merely an interest in trying to support oneself in the world, but to get more than anybody else. In its more normal forms betting is simply a way in which people add a little zest to life, with more interest in the emotional thrill than in the fantasied gifts of compensation. For the most part the football pools seem to have been a mild form of family amusement and, under existing circumstances, betting can hardly be a reason why people organize, play or go to see football matches. If it were systematically organized on the grounds, however, unless this were done with great care, its influence might be different.

Some people may think these interpretations of betting unduly hard, and I am the last person who wants to use psychology in looking after morals which refuse to look after themselves. On the morning of writing this article, however, I received a notice from a big firm of bookmakers, inviting me to open what they called a 'credit' account, which is a polite way of saying 'debit' account. Their chief line of attempted appeal to the reader of the notice took the following form: "*Right through the Card!* The dream of every enthusiastic backer, but a dream which came true for one of our clients, who went 'right through the card' at Ayr and received from us payment at more than £1000 to £1."

It seems unlikely that the conventional moralist will have any more capacity to control betting than he has to prevent people having dreams. At the same time betting is, at least in the present state of social life, often a normal form of excitement to many people, but its relevance to group games is open to serious doubt. The development of football betting was probably regrettable, and it enabled many people unofficially to exploit the game for private interest—though we might object to the Press on the same ground. Active resistance by the football authorities to organized betting on the field of play or within the gates of the ground itself, however, is likely to meet with continued public approval, because betting fails to accord with the real inspiration of the game. It may accord better with the inspiration of card games, which are largely based on chance, and with that of racing, but this may be a different question, because the whole psychology of these games and sports may be different from that of group games which are chiefly based on co-operative skill and team work.

VII. Class and sex distinctions

A very interesting group of problems about the psychology of sports is connected with the social class and sex distinctions expressed in them. The Rugby and Association games were, as shown in a previous paper (5), both derived from the common background of ancient and medieval football, sometimes played by whole villages. When football began to be played in the public schools, in the early part of last century, there was a tendency to reduce its violence and also to make a contrast between the dribbling type of game, then characteristic of Eton, and the handling game which became traditional at Rugby. When the Cambridge Rules were formulated in 1848, the two forms of football as we know them were not distinguished, though handling the ball was very much restricted for those who accepted the rules. All attempts to compromise between the handlers and the dribblers failed in 1863, however, when The Football Association was formed. Then the followers of the Rugby tradition finally withdrew, and later they formed the Rugby Union.

Since this division Rugby Football has tended gradually to replace Association Football as the gentleman's game, and this was partly due to the great developments of professional 'soccer'. Perhaps it was due to the earlier development of organized Association Football, which grew very rapidly in popularity and left the exclusive position to the Rugby enthusiasts. Association Football has become the people's game, and Rugby the game of the more select. It is of great psychological interest that these games have diverged in social meaning, and there are many related problems, which cannot be discussed or solved here. For instance, Rugby Football might be described as less restrained and more violent than the Association game, which is more restricted and controlled and is more removed from the medieval "hustlings over large balls", which were many times officially, though not very successfully, prohibited by law. Do the 'upper classes' traditionally prefer violent and warlike play, and the 'lower classes' traditionally submit to control and accept restraints? Are the 'handling' and 'tackling' so characteristic of Rugby symbolic equivalents of 'man-handling', and is the taboo on touching the ball (the symbol of potency) in Association Football the expression of a traditional fear of authority and control?

Other games besides these two forms of football reflect and express social and class distinctions, and the history of games like golf taken from this point of view would be most interesting. It is also true that many games express sex distinctions. We shall be told that football is not suited to the gentler sex; but are they indeed gentler, and why has it not been adapted to suit them? A gentler six-men game has recently been evolved out of American Regulation Football(3). Golf and tennis have been developed to suit women, and tennis is not particularly gentle. Football has not always been a man's game. At Scone the traditional Shrovetide game of football was between the bachelors and married men; but in Midlothian and at Inverness it was between the single and married women. In football, as we know it, the men fight masculine rivals, and they do not want the interference of women. At golf or tennis, however, we may fight rivals of either sex, and so games in general may be regarded as having developed to express certain underlying sex attitudes and rivalries, which may or may not be more than popular ideas about the differences of the sexes. From what we see of women it appears that they might be quite good at boxing and wrestling if tradition permitted them to try, and the techniques of combat had been adapted to suit them. I can imagine a good many women enjoying the sight of their female rivals' noses bleeding; but these sports have been captured by men as their province, and have evolved so that they now seem necessarily to exclude women.

VIII. SUMMARY AND CONCLUSIONS

If we examine group games from the point of view of the individual and the gratifications he receives in them, we find it is of outstanding importance that they lead him to a constructive use of his aggressive impulses. More from the point of view of the group itself, we find that these aggressive impulses are largely sublimated in the form of constructive territorial combat. Football in general seems to be an expression of impulses towards combat for possession of territory, which are very deeply rooted in animals and in man.

In a particular game, such as Association Football, certain tendencies and taboos are developed, and the game appeals to persons in whom those tendencies seek gratification. Thus the importance of footwork with a taboo on touching the ball in the Association game, compared with the importance of holding and running with the ball in Rugby, and other differences, may be understood. The individual's fantasy life finds expression in innumerable ways in the games which he chooses to play, and he is not likely to be a success at games which fail to satisfy his particular unconscious fantasies.

The *morale* and fair play of group games are due to the impulses of comradeship, to the development of loyalty to the team and leader, and to the tendencies to counterbalance violent expression of aggressive, acquisitive and other impulses in the individual, of which he is usually afraid in himself, by group control. The game allows expression of violent tendencies, but satisfies the individual's anxieties about his own aggressiveness by the development of fair play. *Morale* and fair play are psychological modes of control which have little to do with conscious and conventional morality in origin, but which are of immense social importance and which arise spontaneously from the essential nature of group games and sports.

Professionalism is not psychologically objectionable—quite the contrary; but betting appears to be out of accord with the fundamental interest of group games. Such games often express and represent social class differences and popular attitudes to sex differences, and would repay historical study by the social psychologist. The underlying impulses of group games are democratic in essence, and the world-wide popularity of such games as Association Football indicates the real value of these impulses in human social life, though it may often be obscured in political situations and problems.

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THE RELATIONSHIP OF OCCUPATION TO PERSONALITY

By M. D. VERNON

From the Cambridge Psychological Laboratory

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References (p. 326).

I. INTRODUCTION

In two previous papers (1, 2) the author advanced the argument that the individual's choice of a career or occupation in life is to a great extent determined by the main 'drives'[1] which are fundamental to the motivational side of his personality. Further study of the problem, described in this paper, seems to show that this determination is particularly clear in the case of those whose career is to them a matter of major importance in life. It is therefore possible to study these drives, the basic dynamic tendencies of the personality, by investigating the manner in which such people have chosen their occupation. Of course not everyone feels his occupation to be an important and essential function of his personality. In such cases we should not expect to find that the occupation would afford a direct expression of the fundamental drives. Though no hard and fast line can be drawn between the two types of individual, it is easy to distinguish the cases which lie at either end of the scale.

Some description of the main drives which seem to determine the choice of a career, and of their method of functioning, has already been given in relation to the interests and vocational wishes of school girls (2) and University students (1). It seemed probable that in these children and young adults the main drives were not as fully formed or as well defined as in older people. Moreover, since the final structure of the personality had not been fully formed in the younger persons, the relations of drives to each other—their relative dominance, their combinations and conflicts—had not been as fully established as in the more mature individual. Consequently it was decided to make a further study of those who had already entered some form of regular occupation and had been employed in it over a certain period of time, with a view to observing the operation of their drives in what they remembered of their reasons for their original choice of a career or occupation; for any subsequent change of occupation; for any wishes for a change; and in their attitude to their work and their interest in it.

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[1] A definition of the word 'drive' is given in (1).

For many reasons, it seemed desirable to continue studying the choices and drives of women. A few men were also interviewed, and the author hoped to make a corresponding study of men, but circumstances made this impossible. From the studies of the men interviewed, it appeared probable that the actual drives determining the choice of a career were very similar in men and in women; but that they might be stronger and more clearly marked in the former than in the latter. Indeed, it is possible that for social reasons a man's career is a much more important function of his personality than is a woman's. To many women, situations connected with personal relations, marriage, the home, etc., may be more closely linked to their fundamental drives and essential desires than are situations arising in the course of their daily work. On the other hand, the observations described in this paper, and the information about women factory workers given in a recent paper by Jahoda (3), seem to show that women in professional occupations are more prone to identify themselves with their satisfaction and achievement in their careers than are women in non-professional occupations. That is to say, the former feel their occupations to be integral parts of themselves and essential features of their lives; upon them are centred their hopes and fears; success brings a feeling of personal achievement, and failure a set-back to their potentialities—quite apart from its effect on their economic security. In particular, their occupations afford means of expressing their main drives, which provide the force that energizes and directs their work in these occupations.

Since the majority of women studied were engaged in professional occupations, we have plenty of instances of this 'identification'.[1] Some examples also occurred among women in non-professional occupations; but the sample was too small to give an accurate measure of their frequency.

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[1] This process should not be confounded with the Freudian identification, to which its relationship is unknown.

II. DESCRIPTION OF INVESTIGATION

To describe in more detail the groups of women studied: There were thirty-nine (unmarried) women who had had a University education; thirty-six of these were in professional occupations[1] (or had recently retired from them); two were doing secretarial work, one unpaid social work. In addition there were fourteen (unmarried) women who had had secondary school but not University education; of these four were in professional occupations,[1] two were gardeners, and the remainder were in secretarial or commercial occupations. These women were all interviewed singly by the author. No rigid scheme of interview was employed. In general the subject was asked to describe what ideas she had about jobs when she first started to think about a career; what she remembered of her reasons for entering a particular occupation (or occupations, when she had changed from one to another); how she had progressed in that occupation, and how much it interested and satisfied her; and if she had ever contemplated changing or decided to change it. Supplementary questions were asked to elucidate these points.

In addition, a further study was made of eighteen women (five married, thirteen unmarried) who were applying at an Employment Bureau for jobs. Of these, six had had a University education, the remainder secondary school education. Four were or had been in professional occupations,[1] the remainder were or had been in secretarial or commercial occupations, or doing some kind of non-professional social work. These women were interviewed by the personnel of the Employment Bureau, but the author was able to record verbatim the answers of the applicants, which were often illuminating, and gave additional information on various points.

III. SOME IMPORTANT PERSONALITY QUALITIES

It is necessary first to consider the type of drive which operates in determining the choice of a career, and in maintaining the ability to carry on that occupation with a reasonable degree of success and satisfaction. The drives which seemed to be of the greatest importance in these respects were described in the two previous papers (1, 2). They were listed as follows:

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[1] These included: teaching (University, school and training college), medicine, nursing, research work (University and industrial), librarianship, social work (mental health), accountancy. The majority were teachers.

Security. The drive towards self-maintenance and self-preservation, particularly towards achieving economic security.

Pleasure. The drive towards obtaining rest and relaxation, and also variety and amusement; the nature of this drive was somewhat diffuse, but it was best characterized by the phrase 'wanting to have a good time'.

Activity. The drive towards activity and work, towards the full employment of one's energies and abilities in practical activities, such as the manipulative and physical activities, where the drives arising in connexion with social relationships (q.v.) are not greatly involved.

Self-reliance and *independence.* Two closely related aspects of the drive towards self-sufficiency, looking after oneself and not depending on other people, acting on one's own initiative, and, in some cases, showing independence of thought and ideas.

Superiority. The drive towards excelling others, either through one's own abilities and achievements, or through belonging to a superior social class or occupation.

Dominance. The drive towards exercising power and authority over others, either directly and personally, or through membership of a dominating group.

Display. The drive towards exhibiting oneself in some way in order to obtain social admiration.

Social conformity. The drive towards conforming in one's behaviour and ideas to those current in one's social group (either a small group of family, friends, etc., or a large group of society). This also included in some cases gregariousness—wanting to be with others and mix with them; and in some cases submissiveness and dependence, depending on others to guide and protect one rather than upon one's own initiative.

Humanitarianism. The drive towards helping and protecting others, and showing them sympathy and good-will.

Different individuals possessed drives differing not only in nature but also in strength, persistence and consistency. Thus the nature of the personality as it functioned in the individual's choice and conduct of her career varied according as it exhibited many or few strong or weak drives. The distribution of these drives in the individual, their relative strengths and their mutual relationship to each other, were of paramount importance in determining the nature of the personality. In stating this, it is not assumed that these drives as we have described them necessarily constitute basic and unanalysable parts of the *structure* of the personality. They are the dynamic manifestations of the structure as it functions at the present moment, or as it functioned at some stated moment in the past. And though we are about to describe the more immediately apparent aspects of the personality structure, we do not pretend to be able to analyse its basic constitution, or the manner in which this was developed and determined. But a thorough and detailed study of these immediate aspects and functional tendencies seems a necessary antecedent to such a fundamental analysis.

Among the individuals studied here it was possible to distinguish: (1) *unitary* personalities, which were dominated by a single strong drive, or by two closely related ones; (2) *conflicting* personalities, in which one or more strong drives conflicted with one or more other strong drives; (3) *multiplex* personalities, in which several drives of varying strength existed side by side without awareness of conflict; (4) *integrated* personalities, in which conflicting drives had been reconciled and were now functioning in harmony with each other. In addition to these there were the individuals, to whom we have previously referred, who exhibited no strong drives functioning in connexion with their occupations, and who therefore possessed no very strong determination to succeed in these.

The ability to carry on an occupation successfully over a considerable period of time resulted to a great extent from the individual's total energy or driving force, a quality sometimes called '*strength of purpose*' or *determination*. It seemed probable that this quality was connected with the strength of the particular drives in the individual, but was not solely a function of these. It will appear from the cases described below that the 'strength of purpose' of the individual who possessed strong but conflicting drives was often uncertain and fluctuating. The 'strength of purpose' of the unitary personality was considerable, but, as we shall see, this purpose was sometimes rendered impotent by frustration which could be surmounted by the integrated personality.

The relationship of the drives in the various types of personality also appeared to be closely connected with the quality of introversion or extraversion. The awareness of the introverted individual was directed inwards, so that she observed to a greater or less extent her own drives and the manner in which they directed her towards certain activities and interests. If she possessed a conflicting personality with strong drives that directed her towards opposing and mutually inconsistent types of behaviour, she was aware of this internal conflict. But in certain cases, as we shall see, she was able by understanding the nature of this conflict, and choosing activities which gave an outlet to the different drives, to resolve the conflict and become an integrated personality. The extraverted individual, however, was not immediately aware of her own drives, since her awareness was directed outwards upon the environment and its use to herself. Thus she tended to project any fluctuations in activity and any inconsistencies in behaviour upon the people round her, attributing the frustration of her drives to the resistance of others rather than to the impossibility of satisfying mutually inconsistent drives. These drives might then continue to exist side by side without there being any awareness of internal conflict, in what has been called the multiplex personality.

Another factor of importance to the individual's behaviour in carrying on her occupation was her reaction to frustration. The unitary personalities often possessed drives of sufficient strength to cope with obstacles and difficulties by overt activity, and these individuals did not meet with great frustration. The multiplex personalities could generally project their difficulties outwards, and therefore they did not experience frustration within themselves. The conflicting personalities, however, frequently could not act suitably, and whenever their drives were strong they in general experienced strong emotion, of one or other of two contrasted types: (1) anger, resentment and rebelliousness, or (2) fear, submissiveness, depression and feelings of inferiority. Those unitary personalities who had not been able to surmount the obstacles in their path showed similar emotions. But sometimes these emotional states were avoided either by aloofness—holding oneself apart from the field of conflict and its emotional repercussions; or by an actual escape from the situation which contained the obstacles. In the integrated personalities these emotions were much less prominent, since the individual had found a satisfactory way of life which did not conflict with her desires. In general, the more aggressive emotions appeared in the individual with strong drives, particularly drives such as superiority, dominance and independence which tended to make her assert herself against others. The more submissive emotional reactions appeared in those whose drives were weak, or were predominantly calculated to make her submit or conform to others.

But it must not be implied that the choice of an occupation and the ability to carry it on successfully were determined solely by the drives and their relationship in the personality. In the previous paper (2) we described the influence of other innate factors, and also of the individual's environment and upbringing. Important among the innate factors was the individual's intelligence, in both its quantitative and qualitative aspects. Clearly the choice of certain professional occupations, and the chance of succeeding in them, were limited by the degree of intelligence possessed. They were determined also to a considerable extent by the quality of the intelligence, which was frequently displayed in the individual's other interests, as well as in her interest in her occupation. Different types of intelligence which may be instanced are: the abstract and logical, the creative and intuitive, the academic, the concrete and practical. The first will tend to create interests in philosophy, mathematics and some branches of science; the second in art and religion; the third in 'knowing' rather than in 'doing'. The fourth, more directly connected with everyday life, could be further differentiated into ability and interest in dealing with people directly, in manipulating things, and in physical activity and bodily exercise. We shall give further illustrations of these varying types of intelligence in describing actual cases.

Finally, it was clear that the choice of an occupation was influenced very greatly by the environment, particularly the social environment which operated during childhood, constituted by parents, teachers and companions. It is true of course that this influence was more obvious where certain drives such as conformity and superiority were dominant in the personality, than when other drives such as independence and altruism were dominant (see (2)). Since the majority of the individuals described in this paper belonged to the cultured and educated upper middle and professional classes, the environmental influence was relatively homogeneous throughout the group, and did not differ as much as it did among the children described in (3). Not the least important effect of this influence was seen in the 'identification' of the individual with her occupation, which we have already noted as being of frequent occurrence in the professional classes. Closely related to this was the encouragement which had been given in childhood to independence and self-reliance, to superiority and, to a lesser degree, to dominance; thus it was natural that these drives appeared frequently and clearly in the individual's choice of an occupation, and her attitude to it. Since most of the individuals were in comparatively comfortable circumstances, the security drive had not been strongly stimulated in them. Moreover, in this class of society the mention of the economic factor in connexion with the choice of a career is to some extent socially tabued; thus it is quite possible that the security drive played a greater part than the individual was aware of, or would acknowledge.

IV. DESCRIPTION OF CASES

It is not possible to give instances of all the variations in personality which were described in the previous section. However, certain characteristic cases of unitary, conflicting, integrated and multiplex personalities are presented below. As far as possible, the behaviour and ideas of these individuals with regard to their occupations is described in their own words; and certain additional information is given to illustrate the manner in which their personalities functioned in relation to their occupations.

(1) *Unitary personalities*

We have already noted that the independence and superiority drives appeared frequently among the cases described in this paper. They were especially characteristic of the unitary personalities. Though the latter were not altogether very numerous, there were a few strongly marked cases. Of these the most outstanding was that of 1, who possessed strong independence and superiority drives. She was a highly gifted individual, with an intelligence excellent in degree and broad in extent; it was partly abstract in quality, but also had an artistic and creative side, and a good academic understanding of human affairs. Thus she was able to excel in independent research work necessitating a generalized view of certain social activities:

She was of foreign birth and upbringing, and had had an unusually wide cultural training. She came to this country at the age of seventeen, in impoverished circumstances, and was faced with the immediate necessity of earning her living. But "we still had large ideas of living as we wished"; "I was very ambitious, not for a job or a career, but for knowledge". "I was in a new world where I was an outcast, though I only half realized it, and that I must make my own way in the world." She was entirely dependent on her own efforts; "I was too proud to say I was hungry". "Being quite unrepressed and quite confident, I tried for a teaching job; I didn't want governessing, because they seemed like a slave class." But at the school where she obtained a post "the people were ordinary, limited, narrow, uncultured"; "I didn't want to stay there indefinitely, but was ambitious to get something better". "I was blindly groping after a way of going to the University." "I was anarchic, and decided to make myself an expert where there were few people competing, and I would be able to get somewhere out of the ordinary ruck, and not be limited and tied down." "For eleven years I was doing odd jobs"; "I earned just to provide enough to live on while going on doing research". There was "no time and no money for intimacies, and hence no opportunity of getting married". She spent eight hours a day on teaching and eight on research work. Finally entirely through her own efforts she obtained a good University position where she can use "her own literary and creative side as well"; "I never thought I could be so lucky".

Thus 1 is an excellent example of an individual who was not only outstanding in ability, but possessed enough 'strength of purpose' to enable her to surmount great obstacles. And in this case her determination seemed to proceed from the two strong drives of independence and superiority, her other drives being too weak to offer any opposition, at least as regards her career.

2 showed strong independence and superiority drives. She possessed a good academic intelligence and had had a good education, but had been prevented by ill-health from following her chosen career of medicine. Although she did not appear at all suited by motivation or type of intelligence for a medical career, nevertheless she felt she had been frustrated and in consequence her determination seemed to be impaired in strength and to be frittered away in resentment and aggressiveness. She thus affords a good example of the inability of the unitary personality to cope with real frustration from external obstacles, and to replace a line of behaviour which it is unable to follow by some more feasible one:

> She spends part of her time lecturing; "I like it immensely, I enjoy travelling and meeting people". But "there is no money in it". She also helps a friend who runs a private school in managing and organizing, "taking the responsibility if she's away". "I could organize anything in connexion with a school, but wouldn't like keeping accounts and dealing with bothering parents." "I dislike teaching—putting duds through the School Certificate." "I'm not born to it—I'm too rebellious against exams." She would like a job abroad "in some country where I could learn the language". "I was offered a lectureship in America, but turned it down because I disliked the American education system"; it's "superficial and cramming".

3 also possessed strong independence, with some degree of superiority. But these drives had not found a satisfactory outlet in her work, and she had therefore avoided painful feelings of frustration by an aloof attitude, an academic interest in human problems with little personal interest in people. This seemed to result also in a lack of determination and 'strength of purpose':

> She had a certain degree of artistic intelligence and "I began by thinking vaguely I should like to write"; wrote a lot while at the University, and has done a certain amount since. But "I had to earn money, and realized that teaching seemed the only thing that paid". "I had always thought I should hate it, and did; got out of it as soon as I could." "I was more interested in my subject than in the people I was teaching; I had no interest in making them appreciate it when they didn't, though I liked sixth form teaching; I hated the supervision of girls, making them put on their goloshes, etc." "When thinking of other possible jobs was conscious of all the things I couldn't do, and therefore had to stick to the things I could." She took a librarian's course, and obtained a post as librarian; it was "badly paid, but great fun". Has enjoyed her present job a lot; "you are left to run it for yourself"; it is "a varied job",

but it is "very tie-ing; you have to be there rigidly during hours". But "I thought I was ready for a change", and has recently gone to another job.

4 had even less determination. Though possessing considerable superiority, she showed more conformity than independence and self-reliance, and an even greater tendency to avoid difficult situations than did 3. In fact, she seemed to shrink away from all possible obstacles, and might crumple up in the face of real frustration. This, however, she had not so far encountered, because she possessed every advantage of up-bringing and environment, and a good academic intelligence; thus her superiority had been satisfied at every step:

"I am doing the only kind of work I can do or ever wished to do." At school "things were made easy for you; it was considered the thing to do to go to the University". "I had always assumed I would; I felt it was the only thing I was fitted for; I knew I wanted to go on" with research work; "things were made easy by my tutor". The conditions at the University are "ideal for research work". "I can't think of anything else I would be any good at." "I shouldn't like school teaching, though I might have to do it if pushed to it; I hate the routine and lack of leisure." She previously had a post at another University; but "it was rather elementary work teaching there".

But unitary personalities were not invariably centred about the independence and superiority drives. There was another type of individual, who was not very numerous in this particular sample of women. Examples of this type were scientists, domestic scientists, gardeners, physical training teachers and dancers, whose main drive was the activity drive directed towards work giving opportunities for practical action either in the manipulation of things or in bodily movement. Drives operating in social relationships were less prominent in them.

5 had good intelligence of a practical kind. She showed considerable independence and self-reliance, but these were subordinated to a very strong activity drive functioning in practical scientific work. She had found it somewhat of a struggle to surmount the obstacles to the satisfaction of this drive, and hence showed a certain degree of rebelliousness and aggressiveness:

She went first to a domestic science college, urged by her head mistress who thought she had an "'applied mind'". But "I was thoroughly miserable over the work"; there was "too much of the domestic side, not enough science". "I was very keen on doing something really scientific"; but also "I was very keen on anything applied to practical problems". She obtained a science degree by working at evening classes; it was "very hard work", "a fearful grind". "I was planning for an industrial job; the plan became fixed because everyone told me it was hopeless." "I had some difficult obstacles to overcome; there is very little opening for women" in that type of job. Finally she got a post as an industrial chemist; it was "heart-breaking work in awful conditions; it made me feel I wanted to get on in that type of work to a better job". This she obtained. Since then "I have all the time been able to expand the scope of the work"; "I dislike routine work, staying put and not expanding"; but in this job "new possibilities and problems are opening up every day; one is never at a loss for a line of development". "I'm not outstanding enough for original work" but "I enjoy applied work much more than pure biochemical work".

6, a woman of less intelligence and education, was employed in institutional management. She had a fairly strong activity drive, coupled with self-reliance; this directed her towards work which, though not directly manipulative, was active and practical, and involved dealing with things as much as with people. She had encountered fewer obstacles than had 5, and thus gave little evidence of frustration (since her career began); possibly also her drives were less strong:

"After the war...I started life again." But "I was always fond of housework and looking after the domestic side". She took a two-year course in house-keeping and "found it very interesting". "Before that I was lacking in self-confidence"; but "you learned you had to hold your own and not let people put upon you or help you too much—you have to look after yourself". Institutional management is "delightful work; one makes the post what one wants; one has got to work for it". "The work is never the same; you never know what's coming." "I would choose this type of work if ever I had to choose again."

7 was a teacher of physical training, an intelligent and active woman, who had had a successful career, with little if any experience of frustration. She provides a good example of the unitary personality thoroughly satisfied by her occupation and the outlet it afforded to her activity drive, and well adjusted towards life:

She had thought of going into the drawing office of her father's firm but "wanted something outside, not in an office". Thought of horticulture but in the end decided to take up physical training; "I was always keen on games and good at them". She enjoyed the training course although it was "hard work—you have to be strong, otherwise very exhausting". Liked teaching in a High School; "I liked the High School children—a wide range of children of all kinds". "Physical training is more active than other teaching; I never regret" having taken it up.

It is not very easy to demonstrate from these answers the attitude of this type of individual towards her work because she is seldom very explicit about it. But she gives the impression of being thoroughly and happily absorbed in the work itself, taking a real pleasure in the physical and manual activity it involves, or in the manipulation of the objective features of the environment. She seems relatively unconcerned with her superiority or conformity to others. She shows self-reliance and initiative, but there is little accent on any positive drive towards independence such as appeared in the previous cases.

There were also some cases of unitary personalities whose main drive was towards social conformity. Such cases are perhaps more frequent in society in general than they were in this group of women. Such individuals might find the prosecution of a professional career somewhat difficult, since these occupations normally demand a fair amount of initiative and of ability to stand alone without support from others. However, an example of a social conformer in a successful professional position was afforded by 8. Her behaviour seemed to be mainly guided by conformity to the opinion of a succession of individuals whom she regarded as wiser than herself, rather than by conformity to general social opinion; although the influence of the latter did seem to play some part. But the wise suggestions of the former, and her own good academic intelligence, had enabled her to obtain a good position, though it was clear that she was not capable of much original work. She did, however, possess sufficient self-reliance, in addition to her strong conformity, to fill positions of responsibility:

> Her "head mistress suggested" what subject she should specialize in. She had thought of teaching while still at school; "I was sure I was going to teach while at college; most of my friends were going to do it; I didn't contemplate anything else." But the principal of her college "wanted me to be a University lecturer" and suggested a certain school of training to her; though when she went there she "found it hard to find anything to work on—there was less supervision there". Her tutor "suggested" her applying for a certain University appointment, which she obtained. "I was quite happy there, but got rather fed up with having no responsibility; I liked running things, and held as many offices as possible by the time I left." She was "told" by another tutor to apply for another University post—which she did although "I was loth to apply; I was afraid of having to go there for life". But when she obtained the post "I liked the responsibility—grew into it; I had never been in a responsible position before". Finally she was invited to take up another position; "I had always wanted it in theory; friends suggested it as the thing to do; I felt I should be much wounded if I weren't considered". "I was more suited perhaps" to the previous position; "I'm not sufficiently intellectual" for the present one; "I have ideas for research when there's no time to write, then they disappear when I get down to it". "I have often wondered if this has been the right way, but nothing else suggested itself."

But when circumstances were less favourable, the more dependent social conformers might find much difficulty in filling professional positions satisfactorily, since they were unable to live up to all they felt was required of them. Thus they felt frustrated, though in a manner different from that of the more aggressive unitary personalities described above. Their typical emotional reactions were those of fear, depression and feelings of inferiority. 9 affords a good example. She possessed good academic intelligence. But she could not conform both to the attitudes inculcated by her parents, with their over-stressing of the importance of this intellectual outlook, and also to the more practical intellectual activities of teaching:

> She was brought up as "a delicate only child living in the depths of the country"; didn't go to school but "was left to read alone and I wanted to go on with it; was left by my parents to follow up things for myself". She was taught by her father and specialized in the subject he taught her. "I always knew definitely I wanted to study; I loved reading and study, and University teaching was the only thing giving opportunities for that." "I loathed the idea of school teaching"; "I had two years of it and hated it"; "I was frightened of children" (not having been to school herself). But she liked teaching students; they were "not alarming like children". "I hated administrative work"; "I delight in research"; "true religion and sound learning have always been my main ideas". Finally she had to leave her University post "because of looking after my mother; I could no longer keep it and be a home daughter; I had great difficulty in doing so (leaving); they didn't want me to go", and she disliked it also.

(2) *Conflicting and integrated personalities*

It is convenient to consider the conflicting and integrated types of personality together, since the integrated personality generally showed a history of conflict earlier in life. The most frequently occurring conflicts were between the independence and superiority drives which caused the individual to set herself apart from or above the social group, and the social conformity drive which linked her more closely to the group, or the humanitarian drive which directed her towards a closer contact with other individuals. In some cases also there appeared to be a conflict between social conformity, submersion in the group, and humanitarianism, the individual approach towards other individuals.

10 presented an interesting example of an unresolved conflict between superiority and independence on the one hand, and social conformity on the other. She possessed outstanding intelligence mainly of the abstract type. But she had also had from childhood a generalized objective interest in human activities and customs. At the same time she was considerably influenced by a rather unusual upbringing, which had included a large amount of foreign travel. Thus the independence drive took the form of a desire to stand away from other people and observe them objectively; not to be submerged in and identified with any group. This desire was felt to a certain extent to be 'superior'; the attitude of independent observation was 'foreordained' since childhood. At the same time, there was a conflict with the desire for superiority which comes through identification with a superior social group. And rein-

forcing this latter was the drive to conform to such a group, felt in sensitiveness to the "effect of familiar people and surroundings", and in an almost oppressive confinement by the limitations imposed by these, which could only be escaped by foreign travel. But although her personality was conflicting, the independence drive, directed by her originality of mind, was dynamically very strong, so that she gave the impression of being an individual of real 'strength of purpose'.

She was determined to go to the University, which after some difficulty she was able to do, and embarked upon a distinguished University career. But "I get sick of academic and social intrigues" at the University; "people become so hypocritical about their work". She has always had a strong interest in travel; it is a habit and "I feel discomfort if I stay put too long". "I like somewhere unknown"; "the effect of familiar people and surroundings makes me behave in an introverted way, puts me on the defensive, but the effect of new languages and surroundings makes me behave in an extraverted uninhibited way, and take the initiative. I am completely adaptable in any surroundings. When adaptable like that to a wide variety of people, one comes to regard conventions as arbitrary, and can't hold fast to any convention. But to make a career, you have to feel your group is superior and has superior ideas, and be fixed to them; to feel some things are right and others wrong." "My interest is purely in individuals, not merely as representing and typical of a group. I am almost blind to differences between people from different groups—I have little subjective impression of group differences."

A conflict between independence and superiority on the one hand, and social conformity allied with security and pleasure on the other, was presented by 11, an individual of a type much more common than was 10. 11 possessed quite adequate practical intelligence but was not outstanding in any way; she had not the ability to fill any position that required really superior and independent intellectual abilities. Her drives were not in themselves strong; thus it was hardly surprising that she seemed to possess little determination and 'strength of purpose':

"I didn't choose anything in particular", "it was all thought out for me by my father"; "I was always familiar with the idea that I should go to college"; "all my school friends were going on to the University"; but "I wouldn't have been heartbroken if it hadn't come off". She thought she would take up a particular subject, though "I was not specially drawn to it", because "I had done best in it", and "I could do it with a friend who was also specializing in it". When she had finished at the University, "decided to research", "thinking I wouldn't teach whatever happened"; did that for two years, but there was "no money and no prospects in it"—"very few jobs and mostly routine ones". Then decided to teach and has "never regretted doing it"; "teaching isn't such a bad job as long as you don't think about going on till you're sixty". "I often wondered if there was any other sort of job to change to, but nothing else would pay as well"; "I occasionally thought of social work, but it doesn't pay"; also "you get nice holidays in teaching".

12, though less remarkable than 10, was a much abler woman with more 'strength of purpose'. than 11. Her intelligence was of a good academic type, with some power of abstraction and some creative ability. Her upbringing was that of a normal upper middle class child, with the moral qualities perhaps rather overstressed by her parents; and she had not been to school. She exemplified a type of conflict between superiority and conformity which was rather frequent among the cases in this group:

> She was taught at home, and did not go to school, but after she had done rather well in public examinations, "the grown-ups decided I should go to college; it was the first I had heard of it". She was not successful at first in winning a scholarship and "I was very disappointed when I failed the third time"; but "I felt obstinate about it" and at length obtained one. She thought of changing her subject, but there was "a long tradition in the family of not liking to change a course once undertaken". "I really wanted to do research work, but it was financially impossible in those days, and I wanted to earn my living above all things—to be self-supporting". "I felt, 'I suppose I shall have to teach but I don't want to'"; there was "no alternative". "I liked telling people the things which I had found out for myself", but was not attracted by teaching the young. "I was more interested in the subject than in the people I was teaching", though "I have got more interested in them as time goes on". "I first had the romantic approach", "then took up the intellectual approach, later still the human approach". "The world of books was really a world of escape"; "I wanted to find something quite different from life in them". "At first I was rather proud of not being interested in other people; I thought the world of human beings an inferior one." She became a University teacher, but "the students didn't like my teaching". "I was told by a student that I was only interested in people's brains, not in themselves." "I was slow in my perceptions of people, and developed an inferiority complex about being stupid at understanding people; I became absolutely overwhelmed by the feeling of this." "I succeeded a very able teacher, and made bad mistakes because I tried to do things her way." But later "I accepted myself and decided to do things my own way, not other people's even if it was better, and therefore my inferiority complex disappeared to some extent; I was no longer self-conscious and miserable about it".

Here the superiority drive demanded an intellectual expression, and when her superiority was not accepted by the world in general, the first impulse was towards retreat into research work, escape into "the world of books". Conformity to family and social tradition, and also superiority again, decreed that she must be self-supporting. A further rejection of her intellectual superiority, this time in teaching, led to the emotional reaction constituted by "an inferiority complex". But an acceptance of frustrated superiority, and the decision to "do things my own way", i.e. not to conform to other people's ideas of what should be done, effected a final reconciliation of the conflicting drives, and hence a satisfactory integration of the personality.

13 possessed fair intelligence of the practical type, and had had a reasonably cultured upbringing. Her strong superiority drive led her to desire a position of cultural and social superiority which she was unable to obtain. A painful conflict was aroused in childhood by her inability to conform to such a social background. This conflict was still unresolved and had resulted in strong feelings of inferiority. It was complicated also by a good deal of dominance; this was given some outlet in her present occupation, but was also frustrated to some extent because the people under her revolted against her authority. 13 presents a good example of an individual possessing strong drives but little 'strength of purpose', because of the conflict between them.

"My father's people were cultured people, but my mother's weren't like that"; this "pulled me both ways". "I was great friends with my father, but my mother was jealous of anything she couldn't understand", and had little sympathy for her; also her brothers looked down on her, and "I felt I wasn't wanted". When she was at school she was "prejudiced against teaching"; it was "the only thing expected, which set me against it". Also "my father thought it would make me more bossy". He sent her to a secretarial college, to "a place where I was among elementary school girls"; "it made me ashamed of my job"; "it was really just a place which pretended to train you in order to get cheap labour". But "I was conscientious; didn't like to give it up and so stuck to it". "I really wanted to take up nursing"; "I felt it would give me satisfaction"; "I have always revelled in looking after sick people"; but she was prevented by poor health. She obtained a good position in an office and "I liked this work very much", "it was so stimulating". But she got "strained" by it and was "afraid of a breakdown"; was also afraid it wasn't a permanent job; "men are prejudiced against women" in that sort of work. Was offered a managing job, but "I found it very distasteful"; "it was too much of a strain"; "I had to manage the whole thing", and the "work-people were very difficult". In her previous job was "a professional; I was treated with deference, as a person of importance". "Now I have no entry into society"; "I'm looked down on by my friends"; "I'm very isolated"; "I've held back from pushing among people".

A somewhat similar problem was presented by 14, who was characterized by similar inferiority feelings. But there was no dominance, and superiority was reinforced by security. The conflict was less painful, however; there was no history of conflict between divided parental loyalties, and the drives themselves were much less powerful:

She took up mathematics because it was "the one subject I could do at school"; "I never thought of it from the point of view of a job"; "I didn't realize it was not a good subject for getting jobs in". "I would have liked to do actuarial work"; "I ought to have gone into an office and worked my way up". But she got a scholarship at the

University; "the school was very keen to push people into the University". "Teaching never appealed to me." She had a statistical job for a time, and "liked the work best of all" that she has done. Then took a secretarial job, and likes it fairly well, but is getting bored after seven years of it; there is "nothing mathematical about it", "only routine administrative work"; it is "just a matter of getting used to it—no academic skill is attached to it". "I would like a job with more organization, with opportunity to meet more people", though she is not keen to take a job away from home.

In the case of 15 the drives which conflicted with conformity and security were activity, directed towards physical and manipulative tasks, and some degree of display. She was definitely less intelligent and less educated than any of the above individuals; but she affords an example of the individual who wants to employ her energies in skilled physical or manual work:

"I was very shy as a child and hated being laughed at"; "my sister could entertain visitors and I couldn't"; but "when alone I would dance to myself". "I wanted to take up dancing and teach it"; "I did teach it to younger children at school"; but "I wasn't allowed to" take it up, and had to go into a shop; "in those days dancing wasn't thought much of". When earning her living, joined a small ballet class but it was "too expensive to go on with—I couldn't afford the ballet frocks"; "my mother then recognized I should have taken it up as a child". "I still love dancing of any kind" and "teach it to men friends". Didn't like the actual shop-work much, but "my job gave me scope for other things"; "I was the favourite in the shop", and "liked arranging the flowers". She stayed with a friend who was a sister at a Nursing Home; "I went round doing all the things the nurses haven't time to do, rearranging flowers for the patients, etc.; I worked hard at it and thoroughly enjoyed it". She would have liked a job of this kind, but "there is no paid work like that to do". "I tried to get a job as a dentist's assistant" but there were "none wanted". Went into the millinery department of a shop, where "there is lots to do, even a little too much; I like this, I have lots of patience". It is "cheap millinery, for a poorer class of people"; "I am getting used to serving the country people; I like studying the people". But "I am used to bespoke millinery, and really prefer it".

In the case of 16, the conflict lay in the main between superiority and dominance on the one hand, and independence on the other; but it is possible that the former were reinforced by conformity, the latter by humanitarianism. The conflict was not really resolved, though it seemed to have outlived its original aggressive state, and become more depressed in emotional tone. 16 had had the type of upbringing normal in this social group, and also her intelligence was of the type most common in it; that is to say, it had an academic aspect, but was fundamentally concrete and practical. But it had also a rather unusual artistic and intuitive side; thus she possessed a longing for independent creation which was given some outlet in "the creative part that comes with teaching", but at the same time was hampered by its rules and customs and its "bossing round".

When at school "I exerted some pugnacity in insisting on going to Oxford", because all the staff were Cambridge women; but "my father who died just then was an Oxford man" which strengthened her resolve. On leaving college, "I felt it didn't matter what one did"; "I was not conscious of a vocation; I had to earn my living and there were not many things open". "I started teaching straight away after college, but didn't hit it off with my head mistress; we didn't appreciate each other professionally." "I had a sense of failure which roused my pugnacity, not my inferiority." She obtained another post and "I was happy where I was". She was advised to apply for a headship though "I didn't really want it"; "being a head mistress seemed inhuman and aloof". But she obtained the first headship for which she applied, and remained in that post until she retired. From time to time "I thought of changing"; and finally retired because "I felt a good deal of my mind was not being exercised; I just didn't want to go on and get really tired, too tired to enjoy doing other things". "I have since wondered if it was really my job at all, though I didn't feel it when I was in it"; "I may actually have done it better than I now feel I did after giving it up"; it was "the bossing round—I hated it all the time, but it was part of the job and I accepted it"; "power even in a limited amount may be very disintegrating". "I was sometimes attracted to art, but there is no living in it, and I wasn't really good enough." "I enjoy writing; I have to do something like that to keep me cheerful." "But I do like dealing with people"; "it's the human problem which appeals to me"; "I do (since retiring) rather miss the creative part that comes with teaching"; "I'm not really devoted to children, but I do enjoy contacts with young minds".

17 was another woman in a position of authority; she possessed outstanding intelligence both on the abstract and academic sides, and also on the religious and intuitive. A clash between the rival interests set up by the two intellectual aspects was enhanced by drives towards independence and superiority on the one hand, leading to the remoteness from life of the abstract thinker, and on the other the practical humanitarianism of the social worker. The two drives and interests were, however, reconciled in educational work which included both the abstract theory and the ideals of education, and also practical humanitarianism on its executive side. The result was an integrated personality with more 'strength of purpose' than those previously described in this section:

"I had thought of teaching of some kind as long as I can remember", though adult rather than school teaching. But "a rival interest from fifteen upwards was the political and social'; I thought I might turn to that after teaching". She did badly at the University in her chosen subject; "I was very disappointed over my class"; but her tutor suggested she should change to philosophy, and she "revelled in it"; "I discovered one could study all the answers to the things I really wanted to know". After some teaching and research work in philosophy she went to a training college and developed the teaching of elementary psychology and ethics under the name of "principles of teaching". Thus "I joined up the teaching of adults with my social and political interest". "I was always sure once I had started it that it was the right line for me to teach"; at one time thought social work would enable her to do "something to meet more pressing needs" but training college work "is a really pressing need and the one I could do best". "I have had a fair amount of administrative work, and enjoy some parts of it." She gave up teaching after many years, but "I get satisfied by speaking (on philosophy and religion) and by coming in contact with the young"; "any young people whom you teach or who will make friends with you are interesting".

Another case of integration was presented by 18. She was less intelligent and cultured, and was entirely practical in outlook. She possessed both strong humanitarianism and strong dominance and independence. The former drive caused her to enter the nursing profession, where the two latter drives were thwarted and frustrated, setting up aggressive emotional reactions. But her 'strength of purpose' was such that she was in process of surmounting the obstacles to the satisfaction of the dominance and independence drives, as well as that of humanitarianism:

She meant to become a nurse when she left school at eighteen, but was then too young to begin her training, so took up secretarial work, and went into her father's office; also acted as commercial traveller for a time. But "I felt I couldn't help people with office work, or get any further in it", so she turned to nursing again. She also thought at one time of becoming a games mistress, but "nothing comes up to nursing". She hated part of her training; was "treated very badly"; "one is treated as less than the dust—one's individuality is stamped out"; "discipline depends on the ward-sister" and the work is very heavy. But she worked her way up to a more responsible position; "I prefer organizing work"; "I aim to get as high as possible" and "I hope to do reforms" in the nursing and Public Health services.

An unusual example of a personality, originally conflicting, in whom integration had finally been achieved on a humanitarian basis, was shown by 19. The basis of the conflict is particularly difficult to analyse in this case. 19 was a woman of normal upbringing and good practical intelligence with a strong humanitarian drive which showed itself in an overwhelming desire to be a doctor. Early in her career there was a conflict between this and between independence and security which made her desire to be earning an independent income. But a much more strongly conflicting factor was her hatred of pain and suffering. This may have originated in some painful personal experience (cf. her childish fear of the doctor), or in a latent fear of her own aggression. It now appeared in a horror of suffering in others which drove her both to avoid it and to relieve it. Finally the humanitarian drive overcame the avoidance:

"I had a longing to be a doctor" when still a child, although "I hated even seeing people sick". At one time she had been "afraid of doctors", but later "I was impressed by a doctor who attended us when I was a child, and who suggested I should be a nurse; but I felt I couldn't because I hated illness". It was "necessary for me to earn my living"; "I knew I couldn't and wouldn't teach—I was too shy". So she took up dispensing—it "seemed the next best thing to medicine". It was "a good start, but I wanted the human touch". "I still had an intense yearning to be a doctor, in spite of hating the sight of blood" and although "it meant going through hell seeing people hurt"; though "it was more the apprehension than at the actual time". "I also wanted to be self-supporting", and so continued earning part of the year by dispensing while carrying on her medical training. She wanted to do either general or children's medicine; "an over-exaggerated sense of the value of life put me against surgery". "I like getting round nervous children and making friends with them." Wouldn't like a specialist's work or work in a clinic; "you don't know the people for so long as you do in private practice"; "they have soon gone out of your life". Even in work in a children's clinic "I wouldn't feel I was really looking after them"—only advising them.

Finally we may consider the case of 20, in whom the ruling drive seemed to be social conformity of the very submissive and dependent kind, which gave rise to a conflict resembling that of 9 with strong feelings of inferiority, because she was unable to conform to highly intellectual social groups. But some genuine humanitarianism helped her to get into intimate contact with children. Thus she was able to develop easier relationships first with them and later with the students who taught them. This gave her a stronger determination than she had previously possessed; but her drives were too weak for great 'strength of purpose':

She had decided when at school that she "wanted to stay at home and do domestic science for that purpose". But "an aunt said I ought to earn my own living" and "someone suggested my going to the University"; so she decided to go there because it was "near home". "I was quite ignorant of University life when I came up"; "I was too shy to get much out of University life". "I had no idea what to do" when going down; "I had never previously thought of teaching", but "put in for teaching jobs because my friends did so too" and "got a job at once". "I was a complete failure my first year; I was interested in my subject and in children, but knew nothing about teaching or managing children"; "it was an ordeal to be in front of a class"; and "I didn't get on with the staff". She later obtained a training college post, and finds "I can advise student teachers because of my own mistakes"; "I have gained confidence with experience". Doesn't feel nervous now in lessons because "I am so interested in the children". Also "I have quite a lot of contact with the students and get to know them"; "I like dealing with people".

(3) *Multiplex personalities*

The individuals who were said to possess multiplex personalities appeared to be motivated by drives which would have seemed to be incompatible with each other, and which in other individuals, such as those described in the last section, resulted in conflict. In particular, strong superiority drives existed side by side with strong social conformity. Yet in the main these individuals seemed to be unaware of any such conflict. They did, it is true, report instances of disappointment and of unwelcome changes in their occupations. But in general the causes of these were exteriorized, they were attributed to faults and shortcomings in the social environment, and not to any inconsistency in the desires of the individual herself. Thus, if her dominating or superiority drives led to behaviour which was not successful or acceptable to certain persons in the social group, she tended to attribute the responsibility to these persons and not to herself. She felt that she was successfully conforming to the wishes, opinions and traditions of the social group, which other people failed to appreciate. Thus the whole conflict was successfully projected outwards, and was not experienced internally.

An excellent example of this process was given by 21. She was a woman of the type of intelligence usual in this group, possessed of strong superiority, dominance and social conformity drives. Her social background and upbringing were of the kind more common in the last century than at the present day, in that great emphasis was laid upon morals, duty, vocation, and so on. Some traces of this appeared in the case of 12, described above. But 21, with her tendency to exteriorize her drives, rationalized her desires for superiority, dominance and social conformity as a duty to have a teaching career which gave full scope to these drives. When frustrated by the superiority and dominance of others, she first reacted aggressively, but when this was not successful she either felt nervous or 'retired from the field' and went to another more satisfying position:

> Her headmistress was anxious for her to go to college for the honour of the school. Her father was also progressive in his ideas of giving his daughters a good education, and they felt bound to live up to it. He was rather opposed, on financial grounds, to her going to college, but she was determined to do so and have a career; he rather put her back up—previously she had been rather nervous about it. She had taken up a particular subject because it was her best subject at school; she found it moderately interesting at college, but regarded it mainly in the light of something she could teach and earn her living from. Regarded it as a duty to qualify oneself for a career; teaching was the only career open to University women in those days; there was no thought then of self-expression. She found no difficulty in interesting children; thinks she automatically teaches any child with whom she comes in contact; but finds older girls are much more critical and less spontaneous and easy to lead than younger ones. Is still very nervous of school inspectors or of anyone in a superior position listening to her teaching. Had a dispute with the Education Committee which resulted in her resigning her post and going to a training college, where she has worked happily for many years.

22 had much the same type of intelligence and upbringing. She was less dominating, at least when younger, and her social conformity was of a rather more submissive type. But she seemed to feel it her duty or "vocation" to carry on her work in a particular way; when frustrated and denied the responsibility for which she wished, she "walked out" and took another post:

"I was very shy and retiring as a child." She did the subject suggested by the school; "there was no purpose in me at eighteen". "I didn't set out to teach", but "had to do something"; "I feel I've drifted into everything". "If I had started on any other job, I would have done it; but I never felt there was anything else I might have done better." But nevertheless "I had a vocation for teaching"; "I could teach anything"; "I like taking up anything to teach to people"; "I like getting ideas into other people's heads". After teaching in one place for some time "I walked out of that" because "they wouldn't let me do the part of the work I wanted"; "I wanted to be responsible" for part of the school but "couldn't get it through". But she then obtained a training college post which gave her a satisfactory amount of responsibility and of opportunity of "getting her ideas into other people's heads". There she remained till she retired.

23 possessed more intelligence, both of the academic and practical type. She had little dominance, but fairly strong conformity and superiority. These were less completely rationalized as a sense of duty or vocation. The opposition between the two drives was not entirely exteriorized, but there was no evidence of strongly felt conflicts such as those described in the previous section:

When at college "I belonged to rather an earnest generation thinking in terms of vocation"; they "seriously considered occupations from that point of view, not merely as jobs". But there were "not many jobs to choose from" and therefore "I rather drifted into teaching"; there was "heaps of room for people in teaching" just then; "you could expect to be appreciated as a teacher" then. But "I really wanted to teach"; "wanted something with the human element"; "probably wouldn't have liked the Civil Service or office work". After doing some school teaching, she obtained a University post; "I wanted something less strenuous which gave one time to think and read more"; also "University work is a better paid job". But she found teaching "more interesting than pure research"; "I would have been quite happy school teaching". "I have thought I might teach abroad in a mission school"; "I have a slightly uncomfortable feeling I ought to have done it". But "I never had such an attractive job as I have here"; it is most "enjoyable"; "I like the human contacts".

Finally in 24 we find a striking example of all-round feelings of superiority together with considerable dominance and display, who at the same time felt completely assured of her social conformity, her acceptance and approval by the social group. Like 4 (see p. 303) she had good academic intelligence and every advantage of upbringing and social background. Moreover, her 'superior attitude' may have been due n part to the fact that her parents belonged to a social group noted for its dominating behaviour. Unlike 4, she had no qualms about succeeding in any occupation she took up, and no fear that her conviction of superiority was resented by others, although she might feel contemptuous of them:

> She always wanted to work on her particular subject; "it amused me ever since I was a child". She was sent to the University by her parents and greatly enjoyed it while there. Her tutor suggested she should do research work. "I had no ideas about a career"; "I thought vaguely of teaching"; liked teaching—had organized school work for young children. Also likes University teaching and lecturing "because it is like acting"; "I am amused by University and college politics". "I want a permanent teaching fellowship"; "I want a career you can get on in, a ladder to get up"; that is "the advantage of a University job", it gives you opportunities for that. Has also done some social work, been manager of a church school, run a play-centre; it is "an amusing part-time job, keeps one's feet on the earth", but she wouldn't like it permanently. Has also trained to teach dancing, for fun, but wouldn't do it for a career for anything; it would be "infuriating"; doesn't like the people in it—they are "stupid people and so affected". "My (present) job ends next year" but "I would love to stay on" at it.

(4) *Cases showing little strength of drive*

It is interesting to contrast with the cases previously described those individuals who displayed little 'identification' with their work, and little strength of drive in carrying it out. The following table gives the number and percentage of women in the total sample with different types of education and occupation who seemed to exhibit 'identification':

	Total number	Number showing 'identification'	Percentage showing 'identification'
With University education	45	35	78
Without University education	26	9	35
With professional occupations	44	38	86
With non-professional occupations	27	6	22

Too great a weight should not be placed on these figures, since it was not always possible to determine with accuracy the exact nature of the individual's attitude to her work. They seem to show, however, that it is the professional occupation even more than the form of education which is related to 'identification'. It would probably be difficult for a woman to carry on a profession successfully over a considerable period of years unless she were to some extent 'identified' with it and took a personal pride in it. Thus those women who took little interest in the work for itself tended to gravitate into non-professional occupations (27, described below, is a particularly instructive example of this). Conversely, those women who were compelled by lack of education and unfavourable social and economic circumstances to enter non-professional occupations such as secretarial and commercial work may find that much of the work lacks interest in itself. Unless they possess a strong activity drive, like 15 (p. 310), and are able to find interest either in some physical activity, or in the manipulation of things or of objective conditions, it may be difficult for them to regard their work as anything more than a bare means of livelihood. Now, on the one hand, many of the occupations open to women, the clerical occupations, for instance, give little scope for the functioning of the activity drive. And on the other hand it is probable that many women possess this drive only to a small degree; they are far more interested in personal and social relationships than in 'things'. Thus it is not surprising that women in the non-professional occupations find little stimulus to 'identification' with their work.

The attitudes towards their work of those who lacked 'identification' were various. There was, firstly, the attitude that work was just labour—something one had to do to keep alive, but would relinquish if ever one had the chance. Secondly, there was the attitude that work was a socially approved activity, and that in order to conform to the opinions of society one must display a certain interest and industriousness in one's work. Thirdly, there was the attitude that work was quite pleasant as long as it was not too arduous or monotonous, and, frequently, if it provided plenty of opportunity for social intercourse. None of these attitudes seemed to be conducive to any real interest in the work for itself, or to any personal pride in performing it well. In fact, any kind of work was regarded as a means to an end, not as an end in itself.

25 regarded her work mainly as a means of livelihood, but her choice had been guided by rather submissive social conformity and by pleasure:

> She wanted to go into a bank, but her mother couldn't afford to keep her on at school to qualify for it, so she went into a shop; "mother liked the idea of this job", it was "pleasant work with pretty things" and "not very hard work". But she regrets the "better money" she would have earned in the bank; there's "not much money in artistic jobs". She used to think she would like to be a kennel maid, but "you have to work three years for nothing". Her firm wanted her to go to a job in a London branch, but "I had friends here, so I stayed on"; "I don't really want to go now". Thinks 'I shall stay on unless something very alluring turned up"; but "I might leave to get married".

26 also seemed to be motivated mainly by economic security, but she showed a certain desire for interest and variety as well; and she was

strongly dependent and socially conforming, and hence afraid of responsibility or of having to show any individual initiative:

> She took up shorthand and typing "because all the other careers seemed too expensive". She first went to work in an office where the work was interesting but "I was only a junior, the work was too advanced for me"; "I had too many responsibilities"; "I had all different kinds of jobs to do". Then went into the Civil Service; "a friend suggested it". It is "secure, and people are fairly treated", and there is "good pay". The work is "rather monotonous", "rather mechanical"; "I would sometimes like more brain work"; there is "not a great deal of responsibility". "I have sometimes thought I ought to leave, but nothing else would be so lasting." "I wouldn't like to work in London."

27, however, had well-to-do professional class parents, and had had a University education. She seemed to have taken a job because it was the thing to do, and because it provided a means of passing the time:

> "I didn't want to teach—disliked the school-marm idea intensely"; there was "not much else to do". Someone "suggested a secretarial training" and it "seemed useful", so she took one. She learned to type, but her "shorthand is very poor"; "I never worked hard at it, never could get good at it". "I wanted not to live away from home, in digs", and first of all "got a social job" near her home. But "I didn't like it very much"; "it was just organizing and committee work"; there was "a difficult woman running it" and "I felt just a minion". So she then took a job in a typing office. "I found the work tiring at first", but the "regular routine is healthy, though". "I haven't looked for anything else"; this job "suits me beautifully"; "I know I am indolent, but I am comfortable here". "I haven't thought if I shall get bored with it"; "I live for the present".

Finally 28 gives an example of a type which is less common now than formerly, of an intelligent and educated individual who is motivated almost entirely by conformity to a well-to-do social background that disapproves of women in paid professional occupations. She had some desire to strike out for herself, but insufficient independence and superiority to drive her into doing so in the face of family opposition and social tradition:

> She had been brought up abroad, but was anxious to go to a boarding school because "I felt angular and isolated"; "I wanted to find my feet and get my level"; "I had been so much with grown-ups". One of her teachers and another friend "encouraged" her to go to the University, and her mother "thought it a pity she should go straight back (abroad) at eighteen". But she didn't work very hard at the University; "I had been strictly brought up and kept to heel by my mother"; therefore "so much liberty and so many things to do went to my head". After two years at the University her parents wished her to return to them, which she did, although she "loathed leaving it". "Social life (abroad) was not my line", and it "took me a long while to settle to it". Later she returned to the University for a time, and after graduating "had thought of trying for a job". But it "wasn't necessary or con-

venient" for her to do one. "I had to look after my mother" and later travel with her father. "I might have liked to do some kind of social work". As it is, she has spent her life doing odd jobs.

V. QUALITIES OF THE PERSONALITY LEADING TO OCCUPATIONAL SUCCESS

(1) *Intelligence*

We may sum up these studies of the variable qualities in the personality as it functions in the career or occupation, by considering the nature of the qualities related to success and failure in the occupation. It is of course well recognized that the career which is chosen must be fitting to the intelligence and innate abilities of the individual concerned, and also to her acquired habits and attainments. It is obvious that certain occupations demand a high degree of intelligence from those who enter them. Moreover, they may require a particular quality of intelligence. For instance, the most common women's occupations,[1] school teaching, nursing, secretarial work, commercial work and personal service, require varying *degrees* of intelligence, but it must be mainly practical in quality, rather than abstract or academic; though a certain degree of the intuitive type of intelligence may also be an advantage. But the University teachers and research workers who were relatively frequent in this sample of women required academic and abstract intelligence; and there was evidence that those who lacked the latter were relatively unsuccessful in carrying on original research work.

It is also frequently stated that those whose occupation makes insufficient demands on their intelligence will be unsuccessful and discontented. This seemed to be true of those cases who 'identified' themselves with their occupations, and who possessed appreciably strong superiority drives; examples of this were afforded by 14, 2—and 1 at the beginning of her career. There is no evidence to show that this occurred in the absence of these two factors; see, for example, the cases of 27 and 28.

(2) *Acquired habits and attainments*

Of almost equally great importance are the individual's acquired habits and attainments, including not only what has been learned at the school and University (although the great importance of this was seen with 4 and 8), but also that which depends upon the general cultural background of the home and the parents' social class. This background again includes the cultural factors, which were well demonstrated in the cases of 1, 9 and 13; and the physical factors in the home environment (see, for instance 10's travel habit); and also the general ideas inculcated by the parents. Thus in the case of 12 and 21, and also of 9, we saw the effect of ideas about vocation, duty, obligation, arising from the home background. The conviction shown by 24 of her superiority was due in part to the outlook and traditions of the particular social group to which her parents belonged. 28 owed her inability to settle down to a definite occupation very largely to her parents' attitude to women's work. An even clearer example of the play of rival social influences is shown by 29:

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[1] Out of a total of rather over 5¼ millions of women registered in the 1931 Census as in employment (this excludes those employed in their own homes), 34% were in personal service, 11% in commercial occupations, 10% clerks and shorthand typists. Of a total of 388,806 in professional occupations, 51% were teachers and 40% nurses.

> "I was brought up by maiden aunts, two of whom were intellectual and were anxious for me to go to the University." Her head mistress was also "anxious for me to go on". But "I was the first girl in the family to go to the University; my father and sisters didn't wish it" and "it was difficult to work in the vacations in consequence". "My family didn't want me to go away from home" after finishing at the University, and "I didn't have to earn my living". But "my tutor suggested going away from home" would be a good thing. She was unable for some time to settle down to a permanent job, though she did a lot of travelling abroad which she much enjoyed. Then her cousin, a University professor, suggested a particular line of research work and also "suggested my lecturing on my work". Thus finally she emerged from the family struggle and became a full-time University lecturer and research worker.

No doubt instances of this type of influence could be multiplied if fuller information had been obtained about the atmosphere of the home background; but people were often reluctant to acknowledge the very strong effect of this atmosphere upon their activities later in life. Our information, however, was sufficient to show that these environmental factors, produced by school as well as by home, could exert a directing influence, of which the individual was frequently only partly aware, upon her choice of an occupation and her subsequent conduct of that occupation. Of course it must not be supposed that the individual's choice of a career necessarily conformed to the ideas of parents, school or social group, with regard to suitable careers. This occurred most readily in those who possessed a strong social conformity drive. The individual with a strong superiority drive might endeavour to rise superior to them, while the independent individual might choose something quite different. Thus 10's academic career was independent in every way of the ideas current in her home background. At the same time, some influence of these environmental factors could usually be detected. Thus it is only the individual of very exceptional ability, independence and initiative who is likely to succeed in a career which is completely at variance with all the traditions and influences of her past life. 18 may have been such an individual, but we have no evidence of any others among this sample of women.

We see then that the social environmental factors may have a strong directing tendency which operates upon the individual's behaviour in virtue mainly of her tendency to social conformity. This latter drive may either reinforce the other main drives, may conflict with them or may be overcome by them. Reinforcement frequently occurs in the case of individuals with strong humanitarian drives. The occupations which give most scope for the functioning of humanitarianism are now in general socially approved. This at least is true of teaching and nursing, though perhaps less true of medicine and some kinds of social work. For instance, 19's "father never expected women to do many things, and thought in terms of teaching" and not of medicine. But on the whole the demand in all social classes for women with humanitarian tendencies is greater than the supply, and such individuals find little difficulty in choosing and maintaining a career.

The relationship of the attitude of the social group to the other drives is less unequivocal. We have already maintained that independence and superiority are frequently regarded favourably in the professional classes. This is not always the case, or in all classes. An example was afforded by 29. It is true that she also possessed a strong activity drive directed towards manipulative work, but this did not enter into the conflict, which resulted mainly from the desire to do independent work:

> She was brought up in a small country village, and even when a schoolgirl "I wanted to get away from home". But her father, who was a farmer, "believed a woman's place is in the home; he thought a woman should be able to run a house"; "he thought teaching was the only profession for women and he hated teachers, therefore he didn't want me to go to college". "I had to leave school and come home for a year; I loathed housework and wanted to get away." Eventually she managed to get to college and take up science; "I thought vaguely I should like research". She obtained a succession of scholarships and grants although "dislike of women is general" in her particular branch, and the authorities "were against me getting" a permanent post. However, in the end she surmounted these obstacles and did obtain a permanent research post.

Thus the individual might in some cases expect encouragement and in others opposition when guided by independence or superiority in choosing and carrying on their occupations. The social attitude to dominance was also variable; we saw that 13 and 18 both met with considerable opposition. But 16's use of dominance in her position of authority was on the whole approved. Thus it seemed probable that dominance, as also superiority and independence, might lead to occupations the choice and maintenance of which would conform to the approval of the social group, when these drives existed in individuals of superior intelligence and ability, coming from a superior and successful class of society. At the same time, of course, superiority and dominance exercised in carrying on an occupation are always liable to meet with opposition and resentment from those members of the social group who are being excelled or dominated over. And individuals of lower intelligence and social status are expected to enter humbler occupations in which independence, superiority and dominance can find little outlet. The same may also be true of display (contrast, for instance, the social attitude to 24 and 15); but on this point the data give insufficient evidence. Also the different types of occupation towards which an individual is directed by superiority, independence, dominance and display are given varying degrees of social approval. For instance, occupations in which women compete with men are frequently less favoured than those peculiar to women (see for instance the social disapproval of 29's work). The same is also probably true of the activity drive. It is favourably regarded when it leads to domestic science or physical training. Thus 6 and 7 had experienced few if any obstacles. Social tradition had also urged 5 to take up domestic science, but was against her choice of industrial chemistry, as being a man's job. 15, again, had no difficulty when her activity operated in the occupation considered suitable for her social class—namely, that of dressmaker or shop assistant. She was also able to do dancing as long as she kept this simply as a hobby, but she was not allowed to take it up professionally.

The strong social conformer, as a rule, found few difficulties in her path provided that her abilities were fitting to the socially approved occupation she tried to enter, and unless she was too dependent in her conformity, like 20. But again it is quite probable that anyone like 20, if she came from a lower social class, would find it easier to choose and maintain an occupation requiring less initiative than do the professions.

Economic security, as we pointed out above, is not viewed very favourably in the upper social classes as a direct motive for adopting a profession, though there is little doubt that the underlying drive exists. That and pleasure are, for instance, drives which operate frequently in causing an individual to enter the teaching profession; but few people acknowledged this with the frankness of 11. Again, both these drives would be freely admitted in the non-professional classes, as they were by

25 and 26. Indeed, it seems probable that the nearer an individual approaches the poverty line in the social scale, the more powerful and dominant would be the security drive. And since in the non-professional classes less stress seems to be laid upon 'identification' with the occupation, and upon serious efforts to work hard and succeed in it, the functioning of the pleasure drive in the choice and conduct of the work meets with less disapproval than in the professional classes. For the influence of the social environment as operating through social conformity not only reacts directly upon the other drives, but also indirectly, with regard to the tendency of the individual to 'identify' herself with her work, and to find in it an outlet for her main drives. We discussed the relationship of 'identification' with the social background in section IV (4). Here it suffices to say that the school and University environments usually do all they can to enhance the importance of 'identification'.

(3) *The relationship of the drives in the structure of the personality*

We have already mentioned that the 'strength of purpose' or determination of an individual to carry on her occupation successfully, and her reactions to frustration, were related not only to the strength of the individual drives, but also to their mutual relationship in the personality. The unitary personality when dominated by one or more powerful drives such as independence, superiority, dominance, or activity, possessed considerable 'strength of purpose', and was able to overcome obstacles to a remarkable degree; 1 showed this clearly. If an individual with a unitary personality had less powerful drives, she showed less 'strength of purpose', and she might experience considerable frustration, particularly if she had less intelligence in circumventing obstacles than had 1. 2 and 5 gave evidence of this frustration, which aroused resentment and rebelliousness, since they were emotionally aggressive rather than submissive. But 5, with more 'strength of purpose' than 2, and perhaps fewer obstacles, had been able finally to overcome these and obtain a successful career. 2 had not done so, and was still rebellious and resentful. Less strongly motivated and less aggressive individuals such as 3 and 4 tried to obviate frustration by avoiding the course of activity in which obstacles might be expected. Finally, the thoroughly submissive individual, with weak drives, such as 9, either avoided difficult situations or capitulated to opposition. It is probably in the reaction to frustration that the unitary personality is likely to be less successful in carrying on a career. Such a personality possesses somewhat of a 'one-track' mind, and is comparatively unadaptable, because her one or two drives tend to lead her in one direction only. If this is completely blocked, as in the case of 2, she may remain unadapted, and consequently resentful and maladjusted for the rest of her life. Or she may adopt the almost equally unsuccessful course of avoidance, entering an occupation in which she encounters little opposition, but from which she obtains little satisfaction.

The conflicting personality with strong drives may seem to have even less chance of succeeding in her occupation than has the unitary personality, since one set of drives will direct her towards one type of activity, and another towards another. Even when one activity is finally selected and adhered to, a feeling of frustration remains, either resentful in tone (as in the case of 13 and 16) or depressed (as with 11 and 14); and with vacillation and weakness of purpose as a probable consequence. Only the unusually fortunate individual was able like 10 to pursue alternately the occupations which gave scope to her conflicting drives; and even in her there was a tendency to escape the most difficult part of the conflict. But it was clear that the integrated personalities had been able to adapt themselves by resolving the conflict between drives. The methods of solution offer problems of great complexity and difficulty; we cannot advance more than one or two possible suggestions as to how they took place. In the first place, the gifted individual could sometimes find an occupation which gave scope to the conflicting drives. Thus 17 possessed the necessary intelligence and culture to obtain a position in which superiority and humanitarianism could both operate. 18 achieved a position giving an outlet for both dominance and humanitarianism mainly by sheer industry and strength of drive. 19 was able to concentrate on those branches of her profession in which the ability to relieve pain could be emphasized in contradistinction to the necessity to inflict it. 20 found an occupation in which humanitarianism could overcome her excessive dependence. But even when the occupation continued to afford obstacles to the satisfaction of certain drives, the individual could sometimes adapt herself to this situation through obtaining insight into the nature of the conflict. The clearest example of this is given by 12: "I accepted myself" (and her "slowness in perceptions of people") "and decided to do things in my own way, not other people's, even if it was better, and therefore my inferiority complex disappeared; I was no longer self-conscious and miserable about it". But again only someone with considerable intelligence and a natural gift of insight would be able to achieve such a solution. These cases do, however, illustrate the fact that the 'strength of purpose' and the ability to overcome frustration may be greater in the integrated personality than in the unitary. The wider range of their drives seems to enable them to adapt themselves to a broader field of activities, so that if they cannot successfully carry on one type of occupation or one branch of their profession, they can substitute another.

Finally we must discuss the 'strength of purpose' and the ability to succeed of the multiplex personality. To judge from the cases described in section IV (3), the ability to succeed seems considerable, because the multiplex personality does not feel herself to have failed or to have been frustrated. If obstacles appear, they are usually surmounted or circumvented almost automatically by means of the considerable strength of the particular drive which is being opposed. But the painful feelings of frustration, inferiority and resentfulness which occur in 'inwardly directed' unitary and conflicting personalities are not felt, and thus the individual is aware only of the apparent success of her activities. Nor is she aware as a rule of any incongruity between behaviour produced by one drive and behaviour resulting from some other opposing drive, so that she is able to combine two types of activity or change rapidly from one to another without consciousness of inconsistency. If she does become aware of inconsistency or opposition, she attributes these to the behaviour of those with whom she comes in contact, or even to the exigencies of fate, but disregards the opposition between her drives. Thus she usually manages to carry on her occupation to her own entire satisfaction, though not always to the satisfaction of those around her. Indeed, the exercise of power by such an individual may be dangerous, since she may be quite unaware of the strength and ruthlessness of her dominating tendencies. She often shows great determination; but it is doubtful if this could be called 'strength of purpose', since the latter implies awareness of a single end, or of mutually consistent ends, which is steadily pursued. It was fairly clear that the multiplex personalities thought that they were aiming at some humanitarian end, or at the pursuit of knowledge, and never felt that their real purpose was the satisfaction of their underlying drives.

We must conclude, therefore, that the unitary personality with strong drives will be able to carry on a career consistently, perseveringly and successfully, provided she does not encounter obstacles which cannot be overcome by direct attack. Among such people we must probably include the 'single track' enthusiasts who are the pioneers, the leaders and the reformers of every age. But the best administrators, teachers and humanitarians are those with integrated personalities, who understand doubt and conflict, can adapt themselves to frustration, and successfully undertake a wide range of differing activities.

In conclusion, my acknowledgements are due to the Medical Research Council for the personal grant which made it possible for me to carry out this work, and my thanks to Professor Bartlett for his advice; I also wish to thank all those who answered my questions about their lives and careers.

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STEREOGNOSIS
AND TACTILE 'AUTO-SENSATIONS'[1]

By ALICE BOEHM

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I. INTRODUCTION

THE work of which a short report is given here is concerned with the analysis of the impairment of tactual recognition of objects touched with the left hand in a case with a lesion of the brain, who, from a psychiatrical point of view, had remained absolutely normal. The attempt to explain the case led to a hypothesis which seems to be of some significance for our general conception of the world of touch and of its construction.

The case[2] was that of a highly intelligent woman (LL.D. and student of philosophy) with a psychological training who, about ten years before the beginning of this inquiry, had undergone an operation for the removal of two tumours of the brain situated in the region of the right parietal lobe. Apart from an amaurosis of the right eye, the damage resulting from the lesion was strictly confined to the left side of her body. Tests of her *sensibility* showed a disturbance of all the cutaneous senses and a particularly serious impairment of *kinaesthesis*. There was no impairment of *vision*. Neither cognition nor recognition of objects by touch was possible in the left hand. The right hand showed no anomalies whatever.

II. DESCRIPTION OF THE CASE

Since the failure of her *stereognostic* ability was the most striking characteristic of her tactile agnosia and was, therefore, the main object of this analysis, a few examples may be given to show the kinds of mistakes made by the subject.

A pencil was held by the subject with the thumb and index finger pressed respectively against the point and the flat end (the experiment was, of course, conducted with closed eyes); she reported, "Here is a plane and here a point; but it is only through my reason that I know they are connected". If she laid her left hand with the fingers spread on the table, the impression she received was not that of a continuous plane but only of isolated strips or patches. Thus she was not aware of any parts of an object that were not in direct contact with her skin. Moreover, the impressions were experienced in a certain isolation. On another occasion, when the subject was feeling an ashtray, she imagined that she had to do with a little silver dish which had been tried previously, but searched in vain for the characteristic markings; and she said, "Perhaps the reason why I can't find the details again is that I don't know which direction to try, as everything is isolated". It is understandable, therefore, that she did not notice when she was given two objects to hold instead of one.

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[1] An extract from a psychological analysis of a case of tactile agnosia. The complete analysis was the subject of a research study in the late Prof. J. Lindworsky's department at the German University of Prague.

[2] The author's deep thanks are rendered to this subject whose long-continued interest and acute observation made this analysis possible.

This isolation of impressions, however, appeared not only when experiencing simultaneous but also when experiencing successive impressions, so that the contents, as the subject herself once expressed it, did not coalesce but rather took on a kind of "kaleidoscopic" character. This came out very clearly in the subject's attempts to copy in plasticene the objects she had felt with her fingers; she found it much easier when she was allowed to mould several models each corresponding to one 'aspect' of the object concerned.

The changes, however, were not confined to the apprehension of the object as a *whole*, they also affected the impressions given by the various *elements* of plastic form. Planes, edges and corners were confused apparently in a completely haphazard way; every possible mistake occurred, so that planes might be confused with edges, edges with corners, and corners with planes. Thus the subject would sometimes start from an edge and imagine she was feeling along it while in reality she struck out at right angles to it across the plane surface. This came out especially clearly in an experiment in which the outlines of the tops of pastry cutters, such as are used in the kitchen, were to be traced with the fingers, since here the actual process of touching could be closely watched by the experimenter. It was observed how her finger tips would slip off the edge and reach the table, and how she would go on groping about there and would not notice until much later (often only on account of the difference in the material) that she had missed the object altogether.

Again, while she was feeling an object, one impression might suddenly change to another; what had seemed large would become small, what had been round would all in a moment acquire corners, and that quite often while one and the same detail was being examined. Thus, the subject once reported when feeling a pencil with a case, "Cold, edged. Not always—sometimes it is round. How small it is. Now it is different, it seems to be longer".

Again, the assertion was often made that she got an impression of cotton wool or felt surrounding the objects. But in the case of the sound right hand not even an approximately similar impression could be produced, whether by wrapping the article in felt or by covering the hand with a glove or by any other device.

Summing up, we may say that the most striking characteristics of the subject's astereognosia were, on the one hand, a *failure to synthesize* either simultaneous or successive impressions into a unified conception of the object, and, on the other, a *failure to distinguish contours* owing to an apparently arbitrary confusion of corners, edges and planes.

III. DISCUSSION OF THE PHENOMENA

Difficulties in the explanation of these phenomena arise particularly with regard to the first point. For the want of integration seems, at first sight, to resist any interpretation by reference to a reduction of sensibility, because of its apparent independence of stimulus and response. But, on the other hand, the mere fact that the anomaly was confined exclusively to one side militates against the attempt to explain it either by some disturbance in reproduction or by damage to some higher psychic function; and this quite apart from the theoretical difficulties involved in the latter assumption in view of certain conceptions of cerebral localization still, of course, controversial, which will be touched upon later (see (1)).

The hypothesis on which the interpretation of the phenomena is built up depends on a series of observations from which the following may be selected. In one of the localization experiments in which the subject was touched on the lower phalange of the little finger of the left hand (with a single pointer) she reported, "Two points—on the lower phalange of the little finger and the middle phalange of the fore finger, *but they were quite close to each other*". (The fact—not indeed insignificant in itself—that instead of a single touch two were perceived, need not be taken into consideration here.) What is essential in this context is the circumstance that the two touch impressions, though localized in two different phalanges separated from each other by two intervening fingers, yet were experienced as close together. Now, this experience, contradictory in itself, is strikingly similar to certain optical phenomena appertaining to the vicinity of the blind-spot. Those points that are still just seen with the parts of the retina adjoining the blind-spot and on opposite sides of it appear, on the one hand, not to be separated—because nothing (including, of course, black) is seen between them—yet are not, on the other hand, perceived close together—on account of the difference of their positions in the visual space (2). In the case of our subject, therefore, we may assume that in that part of her hand which extended between the fingers which she believed to have been touched, there occurred at the time a failure to produce sensations which is analogous to the failure which occurs physiologically in the blind-spot. But this is to say that, in the normal subject, the intermediate part which is subjected to no external stimulation—and with it, of course, the entire surface of the body—must obviously give rise to some sort of sensation; otherwise the same kind of impressions, contradictory in themselves, would unfailingly constitute normal experience as well. As a matter of fact, we are always more or less explicitly aware of our own bodies in a way which is not merely representation but very definitely perception—even though our eyes be shut. But how could that kind of awareness be effected unless by sensations from the body continually reaching our consciousness? This will perhaps become even clearer when we compare the subject's impressions of her own body with normal experience. In one of the localization experiments (with the eyes open) in which the subject was touched on the ball of the left middle finger, she first aimed, with open eyes, at the forefinger, groped a little in the air, and then corrected herself to the middle finger. She reported, "There was a discrepancy between the optical and tactile impressions The *index finger was one too many*; I am not conscious of it without looking. I don't know why I made for it with my eyes open".

Two observations, not taken from systematic laboratory experiment but from the everyday life of the subject, are furthermore to be cited here as being particularly illustrative of her experience. She reported that once when she saw a rubber glove lying in the bathroom she had to consider for a moment whether or not the object was her own left hand. This experience will perhaps become fully comprehensible only when we compare it with the second, also taken from everyday life. When turning round in her bed and unintentionally changing the position of her left arm she used to wonder, when the latter happened to touch her thigh, what object had been dropped on her. Thus she experienced her own limbs just as though they were any other object of the external world that she perceived by sight or by touch; consequently, she would occasionally not be able to tell unhesitatingly whether external objects incidentally resembling the human form constituted part of her own body or not. This fact obviously implies a lack of sense data in her experience.

Hence, we arrive at the following hypothesis. Normally, a kind of parallel to the visual grey in the retina is to be found in the tactual field. The sensitive endings of the cutaneous nerves, spreading all over the surface of the body, are, like the retina, in a state of continual excitation brought about by internal stimuli such as, for instance, the circulation of the blood. This produces sensations analogous to the visual grey which may conveniently be called *tactile auto-sensations*. The awareness of one's own body is, to a large extent, based on these auto-sensations.

As for the cognition (and recognition) of objects by touch, we may proceed to the following view which also gives a clue to the interpretation of the subject's most puzzling blunders in stereognosis. The non-optical content experienced in touching an object consists, according to this view, partly of sensations set up both by inner and outer stimuli, and partly of sensations resulting *exclusively* from internal stimulation: the former occur in the places of contact while the latter arise or, rather, persist in the portions of the skin which are not in touch with the object. Now, a pathological rise of the threshold would naturally, in the first place, nullify the sensations dependent on those excitations that are not reinforced by external pressure; the parts of the limb outside the places of contact would therefore remain, as it were, "mute". The mere touch impressions in themselves, however, fail to bring about a perceptual impression of space continuity in the external world because the sense data normally inducing its reproduction—i.e. the sensory continuity arising from the touched limb—are lacking: *the perceptual image of those parts of the object that are not in direct contact with the organ of touch obviously implies a certain integrity of the tactile field as, in an analogous case, the bridging over of the blind-spot in visual perception requires a certain integrity of the optic field.*

Now, as a reduction of response to mere internal stimulation in consequence of the high threshold was to be assumed in our subject, it is easy enough to explain why the details of the objects felt remained for her unconnected instead of being synthesized into a whole. This also explains the fact that when she laid her hand on the table she did not get the impression of a continuous plane. But if she stroked the surface of the table with her open hand so that the nerve endings concerned were excited by extra stimuli, she experienced a continuity of sensation and the plane did actually coalesce into an integral impression, including also the parts lying between the fingers.

The 'kaleidoscopic' nature of her consecutive impressions becomes understandable on the same grounds; as she did not experience any connexion between the details at any given moment she was, of course, unable to gain an impression of feeling one and the same object from various sides in temporal sequence. Consequently, there could be no question of consistent form in the object felt.

Thus, the failure of the subject to synthesize the simultaneous and successive touch impressions was easily explained by the reduction of auto-sensations and, therefore, by a mere disturbance of sensibility.

The second main characteristic of her blunders in stereognosis—the failure to distinguish contours—scarcely gave rise to any difficulties of interpretation with regard to the actual anomalies of her sensibility. The explanation rests, as will presently be seen, chiefly upon the disturbance of kinaesthesis, though the reduction of tactile auto-sensations will prove, even in this respect, to deserve some consideration.

The function of *kinaesthetic sensations* is brought out very clearly by an illusion cited by E. H. Weber(3), which he describes as follows: "Shut your eyes and let the hand rest well supported. A flat piece of glass pressed first gently, then harder, then again gently against the fingertips seems to have a convex surface; but if it is pressed first hard, then gently, and then again hard, it seems to be concave."

Changes in the intensity of pressure while the hand is still, i.e. while the kinaesthetic sensations remain unaltered, are, according to this, conceived as being conditioned by the form of the object concerned—they are "objectivized". A tendency to "over-objectivization" is, therefore, to be expected when, as a result of kinaesthetic disturbance, the actual movements made in the process of touching cannot be perceived.

If we consider this circumstance together with the state of the subject's tactile auto-sensations, we arrive at the following explanation of her failure to distinguish contours. If, when enclosing an object with her fingers, she intensified the pressure exercised without being aware of so doing (on account of her kinaesthetic disturbance), she experienced the increased pressure as 'objective', i.e. she interpreted it as a protuberance of the object. But, as the spot in question showed no tendency to extend itself beyond the place of direct contact, she did not interpret it as a convex plane, as in Weber's experiment, but as a corner. If she then, while still conscious of this increased pressure, moved across the plane, the result might be the impression of an edge. Indeed, as she was only aware of strips when she simply laid her hand on the table, it was only a short step to perceive edges. As an edge showed no more tendency than the plane to extend itself, it could also be interpreted as a corner. And as all the elements of form approximated in this way, the opposite transformations could, of course, just as easily occur.

On the same grounds it is understandable that one impression could turn so abruptly into another; it needed only an unintentional alteration in the pressure exercised, e.g. an unconscious loosening of her usually rather convulsive grip, to change the impression of a corner into that of a flat surface or even a cavity. In the same way the impression of size necessarily varied with the changing extent of the surfaces which were being directly touched at any time.

Thus, the confusion of planes, edges and corners, and the tendency to abrupt changes in the impressions, are to a very large extent conditioned by the errors in *objectivization*; these, in turn, are traceable chiefly to *kinaesthetic* disturbance, though presumably also to the state of sensibility in general; the modifications of the *tactile auto-sensations* are also to a certain degree responsible for the lack of differentiation between the elements of form, though their function, here, has not so great a range as in the case of the conception of the integral form.

The impression of 'cotton wool' surrounding the object can also be traced to the change in the auto-sensations; it is significant that this 'cotton wool' actually seemed to appertain to the left hand itself when this was being used to feel the sound right hand. And finally we can explain in this way why every attempt to reproduce in the uninjured right hand the impression gained by the left hand, by wrapping up the objects presented, etc., inevitably met with failure; for in these circumstances only the effect of *external* stimuli could be modified or warded off, whereas the *auto-sensations* still remained uninfluenced.

This was the explanation of the essential characteristics of our subject's astereognosis. Certain changes in her performance level which were observed during the course of the investigation fitted in at once with the interpretation here presented and provided further confirmation of it.

IV. CONCLUSIONS

The conclusion, then, with regard to the psychology of normal stereognosis is that *tactile auto-sensations play as important a part in the construction of the outer world of touch as the tactile sensations brought about by contact with the external object.* Consequently, correct *objectivization* acquires a new significance: not only in the sense of adequate interpretation of changes in pressure but—even before that—in the sense of *demarcation of the object-conditioned from the body-conditioned sensa-*

tions; in other words, it is a question of the correct realization of the figure-ground-relationship, so familiar in optics, which, in the haptic sphere, finds an exact parallel in the *figure of touch standing out against the ground of auto-sensations.*

Moreover, this conclusion implicitly offers a new point of view by which in future stereognostic disturbances will have to be tested before they can be regarded as cases of 'pure' tactile agnosia: the consequences of raising the threshold will have to be taken into consideration also with regard to the response to *inner* stimulation if the influence of simple disturbances of sensibility on the actual level of performance is to be gauged correctly.

Ultimately, a side-light is thrown on the question of psycho-physical relationship and on the limits of its extent. Our subject, who had sustained a lesion of the brain, seemed to give evidence of a failure of some higher function, i.e. of the ability to synthesize sense data or to 'conceive wholeness'. It might have seemed tempting to assume a *direct* interdependence of that disturbance on the cerebral lesion, thereby implying that higher psychic functions as such may be localized in the cortex. Close analysis of the case, however, showed that all the phenomena apparently indicative of a disturbance of higher functions were, without exception, ultimately to be explained by a mere raising of thresholds. This case of astereognosia, therefore, offers no support whatever to the assumption of a psycho-physical process conveying more than mere sensory qualities.[1] This certainly does not refute the possibility of a localization of higher functions in the brain, but it does seem remarkable that a case apparently so characteristic of disturbance of higher function can, on close examination, be completely explained by recourse to mere changes in the sensibility.

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[1] In the motor sphere, physiological mechanisms localized in the cerebral cortex have to be assumed. F. M. R. Walshe, in a paper on the subject of cerebral localization (4), points out very clearly how this may be conceived.

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FACTORS IN INTROVERSION AND EXTRAVERSION

By H. A. REYBURN and J. G. TAYLOR

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I. *Introduction* (p. 335).
II. *The qualities analysed* (p. 336).
III. *Results obtained* (p. 337).
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References (p. 340).

I. INTRODUCTION

After giving a list of tests which claim to measure introversion-extraversion, Cattell ((1), (2), (3)) comments on it as follows: "The consistency of each of these tests with itself leaves nothing to be criticized, yielding a coefficient near 0·8 in most cases. With one another, however, their agreement is frequently negligible." And he adds: "Apart from the subject's poor knowledge of his own standing (most people think themselves introverts) and from questions of conscious and unconscious honesty...the fact stands out that the authors have not troubled to prove that the clusters of qualities which they attempt to assess are in fact correlated to form an 'introvert' type." Cattell's own view is that introversion is not a unitary character but is a compound involving two independent bipolar factors. The first of them he has described at some length and named surgency-desurgency. The second he has called '*a*', for adjustment, and it appears in a group of traits including frankness as opposed to secretiveness, balanced outlook as opposed to extremeness, objectivity as opposed to subjectivity. He suggests further that this second factor may be related to perseveration, and maintains that there is some connexion of high perseveration with introversion, although there is none with desurgency.

This view, although it seems to be on the right lines, obviously requires further analysis, and the enquiry which is reported here is an endeavour to carry the matter a stage further.

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II. THE QUALITIES ANALYSED

In an article published in 1924 Freyd (4) made a collection of fifty-four traits commonly regarded as characteristic of introversion, and in 1926 Heidbreder (5) attempted to arrange these in order of diagnostic value. From her list we have taken the first ten items, used them to form a self-rating questionnaire, and to each quality attached a uniform five-point scale of marking. The method of administration was as follows. The subjects, taken in groups, had the first quality described to them orally as well as the nature of the scale according to which they were to assess themselves. This explanation was given fairly fully, and the scale of marking was gone over twice before any judgments were recorded. When all the assessments had been made on the first quality, the second quality was dealt with in the same fashion, and so were all the others in their turn.

Although the subjects were not informed that there was any reason to believe that the different qualities in the questionnaire were inter-related, care was nevertheless taken to prevent the mark supposed to indicate introversion from coming always at the same end of the scale. For example, in the first question the 'extreme introvert' would obtain a mark of 1, and the 'extreme extravert' a mark of 5; whereas in the second question the arrangement was reversed. Accordingly in the following list the qualities involved are not described uniformly from the point of view of either introversion or extraversion, but are described as they were presented to the subjects.

1. Makes friends easily.
2. Is easily hurt by remarks or actions of others.
3. Is not suspicious of the motives of others.
4. Does not worry about possible misfortunes.
5. Indulges in self pity when things go wrong.
6. Keeps his head in excitement and moments of stress.
7. Takes prominent part in social affairs and entertainments.
8. Is outspoken, blunt, critical.
9. Prefers working with others.
10. Is subject to changes of mood without apparent cause.

The questionnaire was applied by one experimenter to 115 undergraduate students of psychology, and so far as it is possible to judge a high degree of co-operation was secured. A perseveration test of three items taken from Cattell (3), pp. 216–17) was given to seventy-six of the subjects.

III. RESULTS OBTAINED

The resulting scores were intercorrelated and gave the results shown in Table I. In this table, however, the signs attached to three of the variables, viz. nos. 4, 6 and 8, have been reversed, and in the following discussion these qualities have to be interpreted in the sense opposite to that given in the list above. That is to say, their new meanings are:

4. Worries about possible misfortunes.
6. Is easily rattled, loses his head in excitement, etc.
8. Does not criticize others and is careful of their feelings.

Table I. *Correlation table*

	1	2	3	4	5	6	7	8	9	10	'*p*'
1	—	067	007	−143	−054	029	400	083	289	018	−035
2	067	—	027	281	216	053	001	184	059	247	054
3	007	027	—	−028	−050	078	062	134	163	−253	090
4	−143	281	−028	—	302	163	−171	083	−086	096	150
5	−054	216	−050	302	—	331	−148	175	026	282	−054
6	029	053	078	163	331	—	−043	−014	112	158	−104
7	400	001	062	−171	−148	−043	—	−094	534	−128	186
8	083	184	134	083	175	−014	−094	—	092	−068	235
9	289	059	163	−086	026	112	534	092	—	−170	−179
10	018	247	−253	096	282	158	−128	−068	−170	—	193
'*p*'	−035	054	090	150	−054	−104	186	235	−179	193	—

(Decimal points omitted.)

The correlations are not high, the average, taken irrespective of sign, being only 0·136, with a probable error of 0·062; but in view of the number of larger correlations which the table contains we deemed it advisable to submit it to analysis. Thurstone's centroid method was used, and four factors had to be extracted before the residuals were reduced sufficiently to be attributable to chance. The centroid matrix is given in Table II.

Table II. *Centroid matrix*

	I	II	III	IV	h^2
1	0·2601	−0·3898	−0·1787	0·1312	0·2687
2	0·4782	0·1932	−0·0631	0·0190	0·2703
3	0·0899	−0·1294	0·2034	−0·2316	0·1198
4	0·2399	0·4458	0·0682	0·0589	0·2644
5	0·4419	0·3980	0·2529	0·2675	0·4892
6	0·2932	0·0760	0·2563	0·2506	0·2202
7	0·2245	−0·6085	−0·3279	0·1091	0·5401
8	0·2987	0·0664	0·0290	−0·2775	0·1715
9	0·4143	−0·6303	0·3087	0·2087	0·7078
10	0·1526	0·4322	−0·4213	0·3970	0·5452
'*p*'	0·2203	0·0780	−0·2358	−0·3589	0·2390

IV. ROTATION OF CENTROID MATRIX

In an article previously published in this *Journal* (6) we described four temperament or character factors involved in a portion of Webb's well-known data. One of these we named perseverance, and although it is akin to Webb's own factor '*w*' it differs from it in two ways. On the one hand we interpreted the factor in a simpler and more elementary way than Webb does, laying less emphasis on the voluntary aspect which Webb regards as essential. And on the other hand we gave it a wider scope, making it include emotional stability as well as conative persistence. Another factor, which we indicated by the antithesis of light-heartedness and serious-mindedness, has a close resemblance to Cattell's surgency-desurgency, and may perhaps be identical with it.

These two qualities or factors seem relevant to the present analysis. The tenth item in the questionnaire deals directly with variability of mood, that is to say, with the affective aspect of perseverance as we interpret it, measured from the negative end. We decided, therefore, to use it as a guide in locating the first axis, but in order to give the factor thus derived the same meaning as it had in our previous article, we reversed the signs of item 10 in the centroid matrix, a process which has the effect of measuring the quality from the positive instead of from the negative end and giving it the significance of perseverance and stability rather than of instability. Thus we began the rotation by locating the first axis in such a way that the projection on it of item 10, thus reversed, would be a maximum. We then considered that item 5 is probably heavily loaded with serious-mindedness and can be used to place the second axis. Well-known methods of rotation were employed. Taking the centroid matrix as defining a set of vectors in a four-dimensional space, we rotated the axes orthogonally until the first one ran in the same direction as vector 10, in its new interpretation, and the second in the same direction as the residual vector of 5. This left us with two axes to place, and we found that if we made one of them coincide with the vector '*p*' the other coincided almost exactly with vectors 1 and 7. We therefore chose these positions, and using the orthogonal transformation given in Table III we obtained the factorial matrix shown in Table IV.

Table III. *Transformation matrix*

I	II	III	IV
−0 2067	0·6048	0·5689	0·5177
−0·5854	0·3363	−0·7194	0·1639
0·5706	0·7061	−0·2163	−0·3595
−0·5376	0·1507	0·3350	−0·7591

Table IV. *Factorial matrix*

	I	II	III	IV
1. Makes friends easily	0·0019	−0·0802	0·5110	0·0354
2. Is easily hurt	−0·2582	0·3125	0·1531	0·2876
3. Is not suspicious of motives	0·2977	0·1196	0·0227	0·1280
4. Worries about possible misfortunes	−0·3033	0·3520	−0·1792	0·1280
5. Indulges in self-pity	−0·3238	0·6200	0·0000	0·0000
6. Loses his head in excitement	−0·0936	0·4216	0·1406	−0·1181
7. Takes prominent part in social affairs	0·0641	−0·2839	0·6729	0·0516
8. Is careful of feelings of others	0·0651	0·1816	0·0229	0·3657
9. Prefers working with others	0·3473	0·2880	0·6923	−0·1582
10. Is persevering and stable	0·7384	0·0000	0·0000	0·0000
11. Perseverates	−0·0328	−0·0611	0·0000	0·4840

V. INTERPRETATION OF THE FACTORS

We may now consider the factors thus isolated. In view of the error which is inevitably incorporated in the matrix, it seems unwise to treat as significant any saturation coefficient less than 0·2, and for the purpose of defining a factor even higher coefficients than this are desirable.

1. The first factor has a positive load in three of the variables, viz. 10, *is persevering and stable*, 9, *prefers working with others*, and 3, *is not suspicious of motives*. It has negative loads in 5, *indulges in self-pity*, 4, *worries about possible misfortunes*, and 2, *is easily hurt*. These factor loadings seem consistent with the conception of perseverance as described in our previous article. The quality is essentially emotional and conative stability.

2. The second factor has positive loads in 5, *indulges in self-pity*, 6, *loses his head in excitement*, 4, *worries about possible misfortunes*, 2, *is easily hurt*, and 9, *prefers working with others*. It has a negative load in 7, *takes prominent part in social affairs*. The qualities involved here do not overlap to any large extent the qualities, taken from Webb's list, by means of which we described the antithesis between serious-mindedness and light-heartedness in our previous article. But so far as we can see the two analyses are consistent with one another, and the factor may well be identical in the two cases. Moreover, the factor as it emerges here seems virtually identical with Cattell's desurgency. Cattell has a wider range of epithets to describe the factor than our data allow us to use, but, so far as it goes, our analysis agrees with his, provided that the unsociable character of the desurgent subject which Cattell emphasizes is not identified with an inability to make friends but merely with a dislike for the stir and confusion of social entertainments.

3. The third factor has only three definitely significant loads, viz. 9, *prefers working with others*, 7, *takes prominent part in social affairs*, and 1, *makes friends easily*. It may be called sociability.

4. The fourth factor is of interest. It is defined largely by the perseveration tests, which have a load of 0·48, the other two significant loads being in 8, *is careful of the feelings of others*, and 2, *is easily hurt*. These latter two traits obviously have an interconnexion, some of which is due to the second factor; most, however, is due to this fourth factor which they have in common with perseveration. This result appears to be new. In the literature '*p*' appears as a small, persistent but elusive factor, the functional importance of which has not been clearly determined. The present analysis does not contain sufficient data to provide a decision, but the suggestion it offers should be followed up.

If this general interpretation is sound, it affords confirmation of Cattell's view that introversion and its opposite, extraversion, are not unitary characteristics. Further, it supports his argument that surgency-desurgency is one of the factors involved. But instead of accounting for the remainder by one further factor, it offers three. What Cattell calls adaptation is itself a compound, involving persistence or stability, sociability, and a form of social toughness or tenderness which in some as yet unexplained way is correlated with '*p*'.

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A FACTORIAL STUDY OF MUSICAL TESTS

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I. *Present problem and previous inquiries* (pp. 341–344).
II. *The tests and the persons tested* (pp. 344–345).
III. *Reliability and validity of the tests* (p. 346).
IV. *The results of a factor-analysis* (pp. 346–352).
V. *The development of musical ability* (pp. 352–354).
VI. *Summary* (p. 354).
References (pp. 354–355).

I. PRESENT PROBLEM AND PREVIOUS INQUIRIES

THE primary object of the following research is to examine the hypothesis of a general factor for musical ability and to explore the influence of more specialized factors such as might obscure this general factor or interfere with its measurement. The purpose with which I originally set out was to devise a set of practicable tests for estimating the musical ability of school children, with a view (i) to improving the present methods of selecting pupils for musical education and for a musical career, and (ii) to studying the development of musical appreciation among children generally, particularly in relation to age and educational level.[1] Older tests, such as those of Seashore (2) and Kwalwasser (3), are recognized as inadequate for such purposes; neither the constructors nor their followers attempted to validate the material or the methods employed by any systematic statistical analysis, such as has long been used for evaluating mental and scholastic tests in other fields. Moreover, their tests do not deal with the essential aesthetic element involved in musical appreciation, but are concerned chiefly with the simpler perceptual processes or with the knowledge of musical technicalities acquired in school or elsewhere.

To test capacity for appreciation, as distinct from executive skill or technical knowledge, may seem an elusive and ambitious aim. Nevertheless, in the long series of co-operative researches planned some years ago by Prof. Burt and carried out in the same laboratory by various research students ((7), (8), (9), (14), (17)) considerable progress has already been made with the more general problems of aesthetic ability; and, in several of the researches, tests and assessments of musical appreciation, as well as of appreciation of literature and art, were successfully employed. As early as 1925, on factorizing tested abilities among school children and students, Burt reported evidence for "a group factor for music", i.e. "a distinct and special musical capacity, no doubt highly complex" ((4), p. 20; (5), p. 42). But, probably because tests of literary and pictorial appreciation are so much easier and speedier to apply, most of the investigations since published have been more concerned with them. The present paper, I believe, is the first published attempt at a full and detailed examination of the problem of musical ability by the factorial methods that have been so successfully used in other branches of mental testing.

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[1] My experiments were started in 1933, and the earlier work was fully described in my M.A. thesis on "Tests of musical ability in school children" (1). A short preliminary account was also published in "The measurement of musical appreciation", *St Bartholomew's Hospital Journal*, May 1939.

The experimental and the statistical techniques here adopted follow much the same lines as those laid down in these earlier inquiries, but (as will appear later on) includes several important amendments. As regards the experimental procedure, Burt has strongly urged that, instead of the elementary processes of auditory discrimination to which the tests of Seashore and others are mainly confined, any tests of musical ability that deserve the name should embrace the more concrete and complex processes, such as are involved in ordinary listening and, incidentally, require no special laboratory apparatus. The gramophone tests of Seashore and Kwalwasser have been in regular use at the psychological laboratory, University College, for over ten years. Their reliability proves to be by no means high, averaging barely 0·64. Their raw correlations with independent estimates of musical ability are decidedly low, between 0·25 and 0·40; and, as he observes, these figures are no evidence that the tests measure musical ability as such ("their net correlations, when intelligence is partialled out, are little over 0·10 and therefore, with the groups tested, statistically insignificant").

Though one would hardly guess it from the tests introduced by psychologists, the theory of music during the past century or so has aimed at a scientific account of the chief aspects of musical expression; and accordingly Burt's proposal was to test appreciation for each of these aspects systematically in turn.[1] At the same time he insisted that the principles implied by the choice and marking of the test problems should be consistent with the practice of modern as well as of classical music. As he points out, "the tests of consonance, cadence, and the like adopted by most psychologists rest on principles which would condemn half the post-war compositions, and are entirely out of keeping with the style of music to which the younger generation has become accustomed" (6). The form of the tests was based largely on analogy with the main types of test that had proved successful in other fields; and the material was largely suggested by the exercises commonly set in ordinary musical examinations or text-books, considerably simplified and standardized. The tests proposed included appreciation of rhythm, of melody, of harmony, of chord progressions and of cadences, detecting appropriate or inappropriate instances of each, noting faults of execution, assigning the best titles, drawing up the best critical comments, 'programmes', and emotional descriptions, ranking tunes (either heard or referred to by title) according to relative merit. As actually worked out, they were admittedly imperfect, and their reliability coefficients often low (0·60 to 0·75). But these preliminary results demonstrated at least three things: "first, the importance of a systematic review of the theoretical principles on which musical tests should be constructed; secondly, the superiority of testing the more natural and more complex types of listening; and thirdly the value of assessing not only the individual's *general* capacity for musical appreciation, but also the particular *type* of musical appreciation in which he is weak or strong(6)."

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[1] A systematic study of musical appreciation along these lines, with elaborations of Burt's earlier tests, was begun at the same laboratory some years ago by Miss Mary Wright (cf. (9), p. 265); but her return to Canada prevented the study being carried to a completion. I have, however, profited by unpublished accounts of these and other preliminary studies in which somewhat similar tests and statistical analyses have been adopted. As regards general principles, analogous views have been expressed by Dr Semeonoff in his recent papers on "A new approach to the testing of musical ability" (18); but, as will be seen from my earlier thesis (1), I myself had already adopted these conclusions before his work was published. A brief but admirable review of the literature is given in Vernon's chapter on aesthetic tests (15).

My own investigations, based on many years' experience, have tended to confirm these general assumptions. But the tests I have used are to a large extent original, and, as judged by the statistical results, can now claim a much higher reliability and validity than those previously used. In addition, they are at once easier and more uniform in application, since in their final shape they can now be given by *specially prepared gramophone records.*

For a statistical analysis of the data so collected I have used the modified factorial technique which has been elaborated by Burt for similar studies in these and other fields of aesthetic activity (15). The earlier account of my work has been criticized by musicians on the ground that "music is far too spiritual a thing to be measured, as we measure physical lengths or the weights of meat and metals: hence statistical methods are inapplicable". In reply I would briefly point out that the view of mental measurement which such statements imply is far too narrow. "Measurement may imply one or both of two fundamental postulates: the things to be 'measured' may be arranged in order, so that (i) of any two items, x and y, we may always postulate $x >$, $=$, or $< y$; (ii) of the *differences* between any two items we may also postulate $(x-y) >$, $=$, or $< (y-z)$."[1] Now the measurement of lengths and weights implies (ii) as well as (i); but for the measurement of aesthetic qualities, e.g. musical abilities or musical compositions, only (i) is necessary. The criticism therefore rests on the false assumption that all measurement is necessarily additive measurement.

I take this opportunity of recording my gratitude to the numerous persons who have aided me in so many different ways. To Prof. Burt I am deeply grateful, not only for guidance in regard to the general design of the inquiry on its statistical side, but also for many other suggestions which he has made, based either on his own work or on that of other research students who have worked under him in the same or similar fields. To Prof. Hamley I am indebted for much assistance on the educational aspects of the problem, especially during the earlier stages of my inquiry. I owe a further debt of gratitude to many eminent musicians, particularly to Sir Percy Buck, Mr Cyril Winn (Chief Inspector of Music), Dr Geoffrey Shaw, as well as to Prof. J. C. Flugel, Dr C. S. Myers, and numerous psychologists and students of psychology who have been good enough to submit themselves to my tests, and to the teachers, pupils, and others who either allowed themselves to be tested or assisted me in making arrangements for testing their classes or their colleges.

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[1] The statement is Burt's. For a fuller discussion see his section on "The postulates of mental measurement" (15), pp. 115 *et seq.*).

II. THE TESTS AND THE PERSONS TESTED

The data analysed in the present paper are derived from seven of the more reliable tests. In their final form they are the outcome of over eight years' elaboration and revision. The test material has been recorded on nine 10 in. gramophone records specially prepared for the purpose. Duplicates of the records can be obtained on loan on application to the writer. I have to acknowledge the generosity of the University of London in contributing a grant from its Research Fund towards the expense of making these discs.

The test problems are designed so that they require no special knowledge of musical technicalities, and, within each test, are graded in difficulty, so that the easiest are suitable for children of eight, and the hardest may tax the capacities of a professional expert. The whole takes almost exactly an hour to apply. Full details of the tests, with instructions, key, and passages in musical notation, will be published elsewhere. To save space, the following enumeration must here suffice. The seven best tests involve the following tasks:

1. Detecting the number of notes played on a single chord (occasionally the 'chord' may consist of one note only).
2. Detecting the change of a single note in a repeated chord.
3. Detecting changes of notes in a short melodic phrase.
4. Judging the more appropriate rhythmic accentuation in two versions of the same melody.
5. Judging the more appropriate of two harmonized versions of the same melody.
6. Judging the more appropriate mode of varying loudness (*crescendo, decrescendo, sforzando,* etc.) in two versions of the same melody.
7. Judging the more appropriate phrasing (grouping of notes by pauses) in two versions of a melody.

The melodic extracts are quite short—usually consisting of eight bars only. In each test there are as a rule twenty such items. In addition to the foregoing, which I shall call the 'final series', a number of other tests were used with many of the groups. In the earlier stages of the inquiry these served the purpose of discovering what type of test would yield the highest correlations, and threw further light on the mental processes involved and on particular aspects of the musical abilities or knowledge of the persons tested. In addition, a dozen tests were given to some of the groups by means of a piano; others were also included which did not necessarily involve listening to music: e.g. writing down unfamiliar melodies from dictation, writing down a well-known tune such as the National Anthem, arranging a given list of familiar tunes in order of preference,[1] etc. Most of the pupils also answered a questionnaire (somewhat similar to that of Kwalwasser) on their knowledge of musical symbols and on their musical interests, musical training, opportunities for listening to music out of school, e.g. over the wireless or at concerts.

3615 children have been personally tested. These have been drawn from various parts of the country. Small groups were also tested in Germany. In standardizing the final records, over 2000 boys and girls were used, ranging in age from 8 to 18, and drawn mainly from London schools of various types—elementary, senior, selective central, and secondary. In addition about 300 adults (chiefly students at University College, London, or University College, Wales) have been tested with the assistance of two research students engaged on similar work.[2]

As was only to be expected, the questionnaires disclosed wide individual differences both in musical training and in musical experience. This made it doubly important to rule out, so far as possible, the influence of acquired musical knowledge. The duller children, the average children, and the brighter members of each group were accordingly subjected to a separate analysis from this standpoint; and, although the numbers were large, no significant differences were found in any section between the percentages of correct answers obtained from those who had enjoyed considerable musical training, and those who had enjoyed little or no training and possessed little or no acquaintance with good music. It thus would seem that the tests finally selected are not discernibly affected by musical acquirements.

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[1] Though naturally less reliable than tests based on actual records, this simple test is full of suggestive possibilities which might be exploited by those who have no special apparatus or instrumental facilities at their command. It was one of the earliest used by Burt in his work on aesthetic types. Parallel with his test of arranging pictures, poems, literary extracts, etc., in order of merit, he drew up lists of familiar tunes to be similarly arranged in order of personal preference by the examinees. The primary object was not merely to gauge the general level of the examinee's appreciation, but also, by 'correlating persons', to investigate and measure his approximation to the ideal order of preference characterizing this or that 'type' (e.g. 'classical' *versus* 'romantic', 'rhythmic' *versus* 'melodic' or 'harmonic', 'abstract' *versus* 'sentimental', etc.). In the investigations so far undertaken I have used only the list drawn up for elementary school children, and have confined myself mainly to the former problem: on the question of types see section IV, (ii) and (iii) below.

[2] I have to acknowledge my indebtedness to Prof. Idwal Jones and Prof. Burt for arranging these tests to be taken by students at University College, London, and (after the evacuation of the department) by the Welsh and English students at Aberystwyth; also to Miss Davidson, Miss Slade, and others, who not only undertook the administration of the tests, but also made some preliminary analysis of the data with a view to checking alleged racial differences.

III. RELIABILITY AND VALIDITY OF THE TESTS

The seven tests in the final series were repeated with two small groups. Their reliability proves to be 0·91 with one group (43 boys) and 0·92 with another (39 boys). With the latter group the longer series of tests was also taken twice. For these the reliability was slightly higher, namely, 0·95. The short series of seven tests correlated with the longer series of thirteen to the extent of 0·97. But little, therefore, is gained by prolonging the tests. It may be added that tests based on the gramophone records correlated to the extent of 0·95 with tests in which a piano was used.

Except where the children happened to be learning some musical instrument, it was, as a rule, by no means easy to obtain trustworthy independent estimates of musical abilities from the teachers. For three groups, however, satisfactory rankings were procured. With these the preliminary form of the tests showed a correlation of 0·64, and the final form correlations of 0·78 and 0·82.

When the same tests were repeated within an interval of a week, there was a small improvement, adding about 4 % to the average marks. When the repetitions were separated by an interval of 12 months, hardly any improvement attributable to the previous testing could be discerned. Even when pupils had continued their musical education for a year or more, the instruction received was followed by no perceptible improvement in the later test performances over and above what the untrained pupils also showed, presumably as a result of general mental development during the period. In the supplementary tests of musical knowledge and the like, distinct progress was manifest; and throughout, of course, there was a steady improvement with increasing age and intelligence.

IV. THE RESULTS OF A FACTOR ANALYSIS

In correlating the marks and factorizing the correlations it seemed essential to deal separately with the different groups. Space will not allow me to print all the tables thus obtained; they will, however, be found in my thesis. Here I shall confine myself to an illustrative analysis of a single table only. This is based on a small group of forty-three older boys, aged 14–16. The group is chosen because it is the largest to which all the tests have been applied at least twice. The repetition increases the reliability of the test results and gives a wider range to the marking. Correlations between other groups have been analysed in much the same way. So far as the main conclusions are concerned, the data appear entirely concordant. Thus inferences which could claim little statistical significance if based on one small group alone acquire greatly enhanced credibility when found appearing and reappearing in other groups as well.

For this particular group the correlations between the seven tests are shown in Table I. Since the probable errors range from ±0·06 to ±0·10, all except the smallest coefficients are significant. The correlations were factorized by the methods of 'simple summation' and 'weighted summation' respectively as described by Burt ((15), Appendix I). If suitable communalities or 'variances' are inserted in the leading diagonal of the matrix, it is possible to analyse the intercorrelations between the seven tests in terms of four factors only. The communalities reached by successive approximation are shown in brackets in Table I. The saturation coefficients for the three main factors, as obtained by simple summation, are shown in Table II.

Table I. *Correlations between tests*

Test	7	1	2	3	5	6	4
(7) Judging best phrasing	(0·746)	0·298	0·510	0·291	0·517	0·598	0·430
(1) Detecting number of notes in chord	0·298	(0·652)	0·509	0·588	0·491	0·362	0·119
(2) Detecting change of notes in chord	0·510	0·509	(0·505)	0·567	0·388	0·344	0·136
(3) Detecting change of notes in melody	0·291	0·588	0·567	(0·779)	0·317	0·180	0·060
(5) Judging best harmony	0·517	0·491	0·388	0·317	(0·481)	0·338	0·293
(6) Judging best loudness	0·598	0·362	0·344	0·180	0·338	(0·471)	0·443
(4) Judging best rhythm	0·430	0·119	0·136	0·060	0·293	0·443	(0·383)

Table II. *Saturation coefficients*

Test	Factor (i)	Factor (ii)	Factor (iii)
(7) Judging best phrasing	0·765	0·354	−0·180
(1) Detecting number of notes in chord	0·681	−0·341	0·268
(2) Detecting change of notes in chord	0·669	−0·220	−0·094
(3) Detecting change of notes in melody	0·629	−0·595	−0·174
(5) Judging best harmony	0·638	0·058	0·267
(6) Judging best loudness	0·618	0·292	−0·065
(4) Judging best rhythm	0·421	0·452	−0·022
Average of saturation coefficients	0·632	0·000	0·000
Average of squares of saturation coefficients	0·408	0·134	0·031

Burt's procedure differs from others chiefly in his view of the communalities ('variances' or 'self-correlations'). The estimated test variance he regards, not merely as the sum of the squares of the factor saturations, but as itself the square of an estimated factor saturation, namely, the saturation of the test with *all* the common factors represented in the battery, or, in other words, as the square of the multiple correlation of the test with an infinite number of tests representing the same common factors. Stephenson and others who have criticized these assumptions argue that it is erroneous to suppose that the variances of the tests really differ in any assignable way amongst themselves. The only safe procedure, they maintain, is to assume that all the variances are equal, and to equate each of them with unity. But, even if we accept these alternative assumptions, the essential results here remain unchanged. On inserting 1·00 throughout the leading diagonal of the correlation table, we necessarily obtain slightly different figures; and in my thesis I have fully analysed this alternative form of the correlation matrix: the method of 'weighted summation' was employed, and the computations abridged by adopting Burt's device of summing a geometrical progression instead of repeated iterations.

With a large correlation matrix, the method of 'simple summation' yields coefficients similar to those furnished by Thurstone's 'centroid' method; and the particular form of 'weighted summation' here employed yields coefficients virtually identical with those obtained by Hotelling's method of 'principal components'. In the latter case, however, the correlation matrix cannot be completely accounted for by less than seven factors, i.e. by a number of factors which is identical with the number of tests employed. But evidently the last three or four factors are due primarily to the fact that the variance of each test has been raised to unity; they are therefore of very doubtful significance. In any case, with groups of the size here tested only two or three factors at most can claim any measure of statistical significance; and no matter which of the two methods is employed, for the first four factors the arrangement of the signs, and, indeed, the relative size of most of the coefficients, turn out to be practically the same. The main effect of inserting unity into the leading diagonal is simply to enlarge the absolute magnitude of the saturation coefficients, though, of course, it is not enlarged so much as the total variance. Taking the total variance to be 7·00 (as the second method requires) the first factor accounts for 41 %, the second for only 13 %, and the third for barely 3 %. If we take the total variance to be the sum of the complete communality (as the first method requires), the first factor accounts for over 70 %.

(i) *The first factor.* Whichever form of analysis we adopt, the first factor is responsible for far more of the total variance than any other single factor; moreover, its saturation coefficients are positive throughout. These two facts are sufficient to justify the assumption that all seven tests may be treated as depending upon a single common factor, which we may here briefly designate 'general musical ability' (μ). The name does not, of course, imply that the 'ability' is a simple capacity or faculty: no doubt it is highly complex. Nevertheless, the results allow us to regard our various tests as primarily testing one and the same group of mental processes.

Whether or not there is a 'group factor' underlying musical appreciation is a question that has been answered in the past in two opposite ways. On the basis of his investigations among L.C.C. school children, Burt concluded that a "special or group factor for musical ability existed" over and above the general factor for intelligence ((4), p. 20; cf. (5), p. 42). On the other hand, Spearman a year or two later brought forward reasons for doubting this as well as other group factors. "So far", he writes, "no analogous broad factor has presented itself elsewhere. Most of all, perhaps, it might have been expected in the sphere of music, where not only innate instinct but also environmental encouragement are incomparably more favourable for some individuals than for others. And yet just here the existence of the expected broad factor has been convincingly disproved; the abilities to appreciate, for instance, the relations of pitch, loudness, and rhythm have extremely low inter-correlations; no more, in fact, than must be attributed to *g* alone" ((11), p. 340). On a later page, he seems disposed to attribute any apparent "unitariness presented by musical ability", together with most other "special abilities", to "past experience rather than to native aptitude" ((11), p. 242).

The mere fact that a positive factor is found running through all the seven tests here employed does not, of course, suffice to prove that musical ability is entirely distinct from general intelligence. That is a problem that I shall take up more fully on another occasion. Here I may briefly say that in many of the schools the pupils were tested for other cognitive abilities besides musical appreciation, and that the further correlations seem plainly to show that, although success in the musical tests depends in part on general intelligence, nevertheless there is a large group factor operating in addition which would appear to be fairly specialized. The correlation of ability in the musical tests with general intelligence is positive but low, namely, 0·32 with Burt's Reasoning Tests and 0·30 with the Simplex Junior Test. We may, therefore, legitimately conclude that the correlation of the tests with *g* cannot account for more than one-sixth of their correlation with each other. This seems in keeping with the results obtained by Lowery (20), as well as with those of Burt (6), (9).

As regards the efficiency of the individual tests there seems no very great difference. The best is undoubtedly the test of 'phrasing', which has a saturation coefficient of nearly 0·80. That is quite intelligible; for the surest sign that one has understood a new musical piece is one's ability to grasp its formal structure, just as the surest sign that a child understands a strange passage that he is reading aloud is the fact that he phrases the passage in the way that its logical and grammatical structure demands. The only test with a saturation coefficient below 0·6 is that which requires the listener to recognize the better mode of accentuating the rhythm of a piece. Of all musical capacities the ability to recognize rhythm is probably the most elementary: it develops early, is the most widely diffused, and, as other inquiries would seem to indicate, may exist in almost complete independence of any deeper appreciation of higher developments of musical art, e.g. melodic pattern and harmony (cf. Burt, ap. Board of Education, *Report of the Primary School*, p. 284). We may infer, therefore, that it requires and implies no very high level of musical capacity. As for the remainder of the tests, the introspections obtained at various stages of the research suggest that their order of efficiency corresponds very closely with the order of the difficulty which each test presents to the average (and therefore relatively unmusical) listener; thus, the tests which the less musical find hardest appear to be the best for picking out the more musical.

(ii) *The second factor.* Judged by the χ^2 test ((15), p. 339) the remaining factors could scarcely claim statistical significance, were we restricted to this group of pupils alone. Limitations of space forbid printing similar tables for other groups: but with them the analysis also reveals two supplementary factors subdividing the tests in precisely the same way as that shown in Table II. When a summation method is used, such supplementary factors are necessarily bipolar: but, by applying the method of unimodular transformation ((15), p. 304), we can, if we prefer, convert the bipolar factors into positive group factors. The interpretation remains unaltered.

The second factor, it will be seen, divides the seven tests into two sub-classes. The first includes all those tests in which the essential task of the listener is to *judge* the more appropriate musical arrangement—i.e. to decide the better phrasing, the better rhythmical accentuation, *crescendo*, or *decrescendo*, or (though here the coefficient is much smaller) the better harmonization of a melody; the second group comprises the three remaining tests in which the task is merely to *perceive* a change—i.e. to detect any alteration in a melody, in a chord, or in the number of notes played simultaneously.

Here once again the introspections plainly reveal the true nature of the distinction. As Burt points out, it corresponds to two different attitudes that are adopted by certain individuals, naturally and habitually, in listening to music and may at times be deliberately adopted by one and the same listener on different occasions or for different purposes. One subject, for example, reports: "If a composition or even a phrase is new and unfamiliar, I tend actively to concentrate my attention on the interconnection of the several parts, explicitly educing the relations between them; in such a case I catch myself formulating in technical terms the underlying structure—'full close', 'end of first subject', 'bridge passage', 'how is he going to resolve that suspended discord?' But on a second or third hearing, or in listening to a work that is familiar or fairly straightforward, my attention is more diffuse. I let the structural pattern, now implicitly realized, affect me as a single continuous whole...I no longer educe relations: I submit myself to the Gestalt." The low saturation for the test of harmony is in keeping with this view, since (as the introspections again reveal) it can be approached in two different ways—on the basis either of a relatively explicit chord-analysis, or of an implicit appreciation of the counterpoint. It is hardly necessary to add that the non-musical do not employ this technical language. Nevertheless, their descriptions often tally quite closely with those of the musically trained.

This factor is thus reminiscent of a similar bipolar factor that has so often emerged in testing both artistic and other intellectual abilities. Early work on intelligence tests showed that there were two ways of dealing with a structural object: one "involves a complex synthetic activity comparable to the activity popularly described as intuition—the activity whereby we implicitly comprehend the essential meaning or character of a whole without explicitly analysing it into its component parts"; the other depends upon "an analytic activity which consists essentially in explicitly analysing the whole into its component parts", and, where necessary, educing the relations between them.[1] Much the same distinction has been noted again and again in other fields of aesthetic research (cf. (8), p. 36; (9), pp. 274 *et seq.*; and (10), p. 59).

The existence of this factor is here confirmed by an analysis of the correlations between persons. With this technique, in accordance with the so-called 'reciprocity principle', the second (bipolar) factor obtained by correlating tests commonly reappears as the first to be obtained when correlating persons. This occurs on subjecting my own data to the alternative form of factorial analysis: and the results afford further evidence for these two types of aesthetic appreciation.[2]

(iii) *The third factor*. The third factor has appreciable saturations for two tests only, namely, for judging the better harmonization of a melody and detecting the number of notes in chords. These two are the only tests which essentially depend on listening to notes sounded simultaneously. The remainder of the tests, it will be observed, deal mainly with the melodic or rhythmic outline of the music played. We may therefore regard this factor as distinguishing those persons who have a better appreciation for harmony than for melodic or rhythmic line.

I must emphasize that the foregoing is merely a brief and tentative summary of the factorial results that appear to emerge from a first examination of the data collected. But, so far as it goes, it certainly seems in keeping with the theory of aesthetic factors deduced by Burt and others from tests of non-musical as well as of musical abilities. Several of the factors and types that are here distinguished will no doubt turn out to be highly complex, and analysable into more elementary factors. Thus, the interpretation of the first bipolar factor accepted above usually identifies the 'analytic' type with the 'classical', and the 'synthetic' (or Gestalt) type with the impressionistic or 'romantic': but my own evidence implies that the agreement between the two pairs—the one turning largely on a difference in cognitive attitude, the other mainly on a difference in temperamental inclinations—is itself by no means complete. My emphasis on the distinction between cognitive and conative does not imply any belief in a sharp separation between the cognitive and the emotional attitudes. Here the general inferences I should be disposed to draw come rather nearer those of Krueger than of other writers: and it is interesting to note that his views have also been partly reached through the study of auditory and musical experiences, while (as is well known) he was one of the earliest to enter the field of factor-analysis (12) and to interpret general factors in terms of *Gestalten* or (as he would prefer to say) of *Ganzheiten* (13). Again, in the final series, only one test dealing primarily with the appreciation of rhythm was included, since that type of process has a comparatively weak association with general musical ability. With this set of tests, therefore, it was impossible to corroborate the alleged existence of a separate factor for rhythmic appreciation. Lack of space, however, precludes me from discussing these supplementary issues here.

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[1] Burt (19). For the bearing of this on artistic appreciation, cf. (4), p. 346, and the passage quoted *ap.* (9), p. 290.

[2] The analysis of the correlations between persons was undertaken for me by Miss Davies in complete independence of my own analysis; to save space I do not give any further tables here, nor quote any further introspective reports: both will be found in my thesis. I may add that I had not consciously planned to divide my tests initially into two groups, as the names given above might seem to imply. The tests were first chosen for empirical reasons, and the names allotted only after the introspections of psychologists and musicians had been examined. Judging by their accounts of their own mental processes, the natural attitude of the trained musician, at any rate in *appreciating* a passage, is 'synthetic' or 'intuitive', or, as they put it, 'relatively passive'. This seems confirmed by the fact that the best of my tests of musical appreciation is markedly of a 'synthetic' or 'intuitive' type (cf. (7), pp. 306 *et seq.*).

V. THE DEVELOPMENT OF MUSICAL ABILITY

One of my chief objects was to obtain norms which would enable us to state the average level of musical ability among school children of different ages in terms of the tests here used, and to measure the relative ability of individual pupils. In this attempt a familiar difficulty is encountered. After the age of 11, the general mass of the school population is sorted into two unequal groups. At that age a smaller proportion are drafted to central or secondary schools: in the schools where my testing was done, they comprise, according to the information given to me, nearly 30% of the total number; the remaining 70% or more are left behind in the elementary schools. After the age of 14 the only pupils easily accessible are those in schools of a higher type. Between the ages of 11 and 14, therefore, I have given the averages at each year for the separate groups as well as for the total population. Above that age my averages refer to children from the higher type of school alone; below that age I give figures for what may be regarded as a fair sample of the general population.

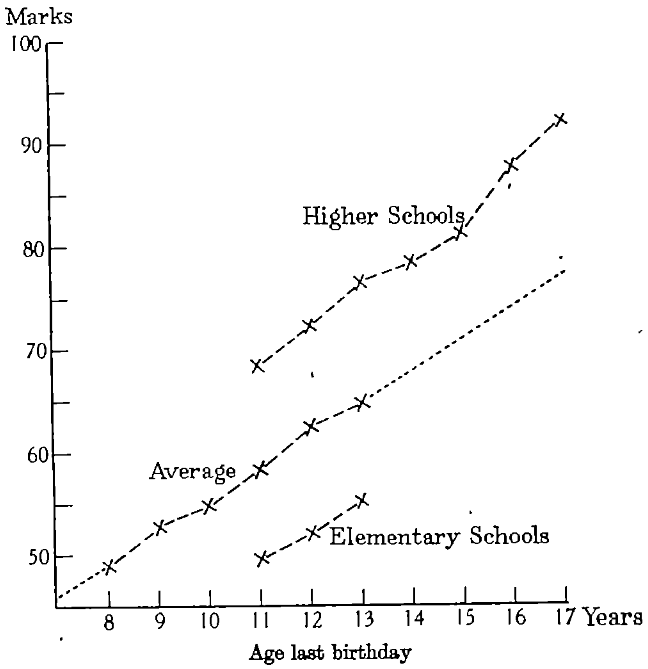
Fig. 1 shows the results so far obtained plotted in the form of 'growth curves'. It will be seen that the general course of development can be represented approximately by a straight line. For the total school population within the ages examined, the averages at each year might be expressed in terms of the following equation:

$$\text{Norm} = 3{\cdot}1 \text{ age} + 23.$$

To deduce the child's musical age from his mark in the tests we may employ the formula:

$$\text{Musical age} = \frac{\text{mark} - 23}{3{\cdot}1}.$$

If we calculate what may be called the musical quotient of the higher school children, we obtain $\frac{14{\cdot}6}{11{\cdot}5} = 127$ at $11\frac{1}{2}$, $\frac{16{\cdot}0}{12{\cdot}5} = 128$ at $12\frac{1}{2}$, $\frac{17{\cdot}1}{13{\cdot}5} = 127$ at $13\frac{1}{2}$, and (if we pool the remaining ages) $\frac{20{\cdot}0}{16{\cdot}0} = 125$ at 16.



Note. The prolongations of the curve for the 'Average' marks are based on the equation—mark = 3·1 age + 23.

Fig. 1. Development of musical ability with age

Similarly for the elementary children the average musical quotient at different ages keeps between the very narrow limits of 88 and 91. Thus, so far as our evidence goes, the musical quotient would seem to be remarkably constant.

This conclusion is confirmed by repeating the tests with individual children at intervals of a year or more. The musical quotients, obtained on the two successive occasions, differ but little; the correlation between the two assessments amounts to 0·92.

VI. SUMMARY

1. As a result of over 7 years' work, a large variety of tests for assessing musical ability and musical appreciation among school children have been devised, selected, and improved. For the main set of tests, seven in all, the necessary musical extracts have been recorded on gramophone discs. With the aid of roneo'd sheets they can be given in group form. In all nearly 4000 children and adults have been tested.

2. Factor analysis on the lines described by Burt has been applied both to correlations between tests and to correlations between persons. The results would seem to confirm the conclusions that he has put forward: they reveal (i) a *general factor* of musical ability common to all the tests and accounting for about 40% of the total variance; (ii) a bipolar factor sorting the tests and the persons tested into two main types—*analytic* and *synthetic* respectively; (iii) a third factor sorting tests and persons into those depending mainly on *harmony* and on *melody* respectively. His further factor for the appreciation of *rhythm* (as distinct from that of melody and harmony) was not confirmed, but this was probably owing to the limitations of the test material.

3. In terms of these tests tentative norms are given for pupils aged 8–17 enabling the marks to be converted into terms of a musical age and a musical quotient. The course of development appears to be linear, and the musical quotient to be remarkably constant.

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PUBLICATIONS RECENTLY RECEIVED

Statistical Calculation for Beginners. By E. G. Chambers. Cambridge University Press. 1940. Pp. viii + 110. 7*s.* 6*d.* net.

As its name implies, this is a book on the manipulation of statistical data, not a book on the theory of statistics which is relegated to the background. After dealing with averages and measures of dispersion the author goes on to a discussion of the normal distribution and the significance of the mean and of the difference between means of both large and small samples. Methods of calculating correlations and the significance of the difference between two correlations are then given, while partial correlation, biserial and four-fold correlation are also dealt with. The last two chapters are on regression and the correlation ratio and on contingency and goodness of fit.

It will be seen that the subject-matter includes all that is in general required by the ordinary research worker and student, so that the book provides them, though they may be without previous statistical training, with a tool by using which they can evaluate their results truly. Special features of the book are the numerous worked examples, the exercises (with answers) and the tables which lighten the arithmetical labour of computation.

There are a number of books dealing with the use of statistics on the market. This can be confidently recommended as one of the best. It is short and concise and within the competence of any ordinary non-mathematical person.

There are three slips which it may be desirable to point out for the benefit of anyone who may purchase the work and read this review: on p. 36, line 6, for "difference between the means" read "pooled observations"; line 9, add "between the means" after "differences"; p. 37, line 1, for "$\sqrt{1/N'}$" read "$\sqrt{N'}$." H. B.

An Analysis of Performance Test Scores of a Representative Group of Scottish Children. By Godfrey H. Thomson. Publications of the Scottish Council for Research in Education, XVI. London: University of London Press. 1940. Pp. vii + 58. 5*s.* net.

This book presents a statistical analysis of the Binet and Performance test scores collected for the Scottish Council for Research in Education by Miss Macmeeken during 1935–7, when practically all the children born in Scotland on 1 February, 1 May, 1 August and 1 November 1926, were given these tests. A battery of eight performance tests was used. A Thurstone centroid analysis was made of all the data. A factor of general intelligence was first isolated; this was common to the Performance and Binet tests, and was therefore free of the verbal bias of the former, and from anything in the latter which is unrepresented in the Binet tests. A second factor in the Performance tests seemed to correspond to speed and rhythm of work. Two other factors were isolated, of doubtful psychological significance; but in view of the comments by Miss Macmeeken on the tests, one of them seemed to have some connexion with aesthetic satisfaction in test performance.

The statistical reader will no doubt find this monograph of great interest; but the more general psychological reader would have liked further information about the psychological nature of the Performance tests and the abilities they measure.

The Child and his Family. By CHARLOTTE BÜHLER. With the collaboration of E. BAAR, L. DANZINGER-SCHENK, G. FALK, S. GEDEON, G. HORTNER. London: Kegan Paul, Trench, Trubner & Co., Ltd. 1940. Pp. viii+187. 10*s*. 6*d*. net.

The main importance of this book lies in its description of a new technique and method of child study. Certain middle class families in Vienna were selected for study; and these declared their willingness to receive trained psychological observers in their homes twice a week over periods of three to six months. The observers took part in all the normal activities of family life; and afterwards recorded in detail the behaviour of the selected children. The aim was to study accurately and in detail the child's relationships, and particularly parent-child and sibling relationships. Good reliability was shown when two different observers prepared records of the same events.

This method of collecting data appears to have been admirably conceived and carried out. But it is clear that such a study must depend for its interest and fruitfulness very largely upon the manner in which the data are systematized; and the treatment of the data appears much less satisfactory. The classification of the child and parent contacts is so involved as to be comprehensible only with difficulty. Dr Bühler and her collaborators have tried to make it objective, and though they recognize that attitudes and purposes must be taken into account in a study of contacts, yet only overtly expressed purposes are considered, and these again are classified into social, pedagogical, organizational, charitable and economic. The stress laid upon this overt and superficial aspect inevitably obscures their more important fundamental nature. Consequently the chapters on General Aspects of Parent Child Relationships and General Aspects of Sibling Relationships, which are devoted mainly to the working out of this classification, are neither lucid nor informative. The chapters on the Individual Families and the Individual Sibling Pairs give detailed descriptive accounts of families and siblings, illustrated by actual conversations and descriptions of behaviour. And from these we obtain a much clearer and better understanding of the nature of the children's relationships.

As Dr Bühler points out, the amount of material so far obtained is not sufficient to permit of any general conclusions being drawn. Data obtained from eight families, containing six fathers and mothers, and six sibling pairs, are presented in this book. The most interesting conclusions relate to the manner in which the children reflected in their sibling relationships, though with characteristic modifications, their parents' attitudes to them. This appeared particularly clearly in the attitudes and behaviour of the dominant child in each sibling pair.

We hope that it will be possible for Dr Buhler to extend the use of this most valuable new technique of child study, though if possible with some modifications in her method of classifying her data.

The Nature of Creative Activity. By VIKTOR LÖWENFELD. London: Kegan Paul, Trubner, Trench & Co., Ltd. 1939. Pp. xvii+272. 76 illustrations in text, 78 Plates. 21*s*. net.

From a study of the drawings of weak-sighted individuals and of the modelling of the blind, the author deduces the existence of a 'haptic' type of artistic production, in which the individual expresses primarily his tactile impressions of objects and the muscular tensions accompanying emotional experiences. This 'expressionist' type of art, which is also natural to certain normal-sighted individuals, is contrasted with the 'impressionist' type, determined by visual impressions of the external environment. In general, the former seems to belong to an earlier stage of mental development than does the latter. Presumably this is because the young child is more immediately and vividly aware of kinaesthetic and tactile percepts, so closely linked to his own body, than of visual percepts with their reference to a more remote and impersonal origin in the external environment.

In assessing children's artistic productions, it is undoubtedly useful to bear in mind the existence of this 'haptic' stage, and not judge the productions purely on the merits of their visual pleasingness or verisimilitude. It does appear, however, that the real importance of this stage lies in its relation to the other phenomena of development, fixation and regression, aspects which the author does not touch.

The illustrations are excellent, and so is the translation from the original German by O. A. Oeser. The title of the book is somewhat misleading.

Personality and Mental Illness. By JOHN BOWLBY. London: Kegan Paul, Trench, Trubner & Co., Ltd. 1940. Pp. xii + 280. 10*s*. 6*d*. net.

This book describes an attempt to work out a comprehensive classification, more satisfactory than existing ones, for psychotic and psychoneurotic types (the author denies the existence of any discontinuity between these). He claims that this can also be used for personality types in normal individuals. It is based, with certain modifications, on Kretschmer's schizoid-cycloid classification—the latter type the author, following Bleuler, prefers to call 'syntonic'. Each of these two 'genetic' types (as he maintains them to be) is subdivided into four or five 'personality sub-types', which cut across the existing psychotic and psychoneurotic classifications. Grouping is carried out in accordance with the possession of certain traits which the author has listed. Thirty-three of these (such as 'solitariness', 'aloofness', 'no sex', etc.) are considered to be characteristic of the schizoid type, though not occurring invariably in schizoids. The remaining seventy-two traits are commoner in syntones than in schizoids, but are not specific to the former.

As regards psychotics, this scheme appears to be valuable and to be based upon satisfactory clinical evidence. As regards psychoneurotics, it is less convincing, and the cases adduced in evidence rather few in number. And, as the author states, "normals may show so few traits that diagnosis is difficult", although "from casual observations of a number of acquaintances it has appeared to me that the majority of them do in fact approximate quite closely to one or other of the types described". Now all types based on patterns or groups of overt behaviour traits have an arbitrary appearance unless some underlying psychological structure or process can be shown to connect the isolated units of the group. The Freudian theory has done this by relating the various psychotic and psychoneurotic types to the degree of regression. The author rejects this theory, perhaps with justification; but in the absence of any other more satisfactory hypothesis, it is difficult to see in his scheme anything more than a neat arrangement of the more superficial aspects of the personality characteristics.

Analysis of Handwriting. By H. J. JACOBY. London: George Allen & Unwin, Ltd. 1939. Pp. 285 + 161 collotype illustrations. 10*s*. 6*d*. net.

This book gives a lucid account of the analysis of handwriting, with detailed descriptions of its characteristic features, and the interpretation of these in terms of the psychological characteristics and behaviour tendencies of the writer. The scheme of analysis is comprehensive and exhaustive, and the suggested interpretations most plausible, especially when those for different features of the handwriting are combined together to give a picture of the total personality, as in Part III, Chap. I. But how far are these interpretations valid? We are not given any evidence as to this. Instead of mentioning briefly how graphological interpretations have been utilized in various practical issues, vocational guidance, psychotherapy, criminology, etc., the author would have been better advised to adduce some reliable evidence of validity. Such evidence might have been obtained by use of the 'matching technique'—getting observers to 'match' the author's interpretations against case studies drawn up from other independent sources. In the absence of some such procedure, the psychologist, though impressed by the author's apparently skilful use of graphology, must reserve his judgment as to its accuracy and usefulness.

Farbenproben sur Prüfung des Farbensinnes: 20., neu bearbeitete Auflage der *Stilling'schen Tafeln*. Von E. HERTEL. English edition translated and edited by JAMES DREVER. Leipzig: Georg Thieme. 1939. Pp. 16+35 Plates. RM. 14–; 24*s*. 6*d*. net.

The new edition of Stilling's Tables contains the majority of the plates from the earlier series of tests for colour vision, but with an increased variety of numbers, letters and spectral ranges. But the $\mathscr{L}$ figures are not very legible for English readers. In addition plates have been added to show up the heightened sensitivity for brightness contrast which often accompanies colour defect. The instructions are clear and concise.

There is no doubt that these plates show admirably if colour defect exists or not. It would be interesting to have an accompanying scale of norms to give some indication of the extent of the colour defect.

The Psychology of Physics. By BLANEY STEVENS. Manchester: Sherratton & Hughes. 1939. Pp. xvi+282. 7*s*. 6*d*. net.

This book seems to be an attempt to provide a *philosophical* basis for physics. It is difficult to see why the word "psychology" should appear in the title.

The Foundations of Empirical Knowledge. By A. J. AYER. London: Macmillan & Co., Ltd. 1940. Pp. vii+276. 10*s*. 6*d*. net.

PROCEEDINGS OF THE BRITISH PSYCHOLOGICAL SOCIETY
1940

GENERAL MEETINGS

April 4–8, 1940. Extended General Meeting at Birmingham.

April 4.

1st Session:

Business Session, followed by a paper.

"Psychological Factors in Musical Composition and Improvisation." By J. Mainwaring. (Illustrated at the piano.)

April 5.

2nd Session: (Arranged by the Education Section.)

Business of the Section, followed by papers.

"Language Ability in Deaf Children." By Ernest Lund.

Discussion on: "The Problems of Evacuated Children."

Speakers: E. M. Bartlett, A. H. Bowley, C. Preston Rawson.

(Afternoon.)

Visits to the Child Guidance Clinic, Edgbaston; the Juvenile Employment Department of the Birmingham Education Office; and the Medical School of the University.

3rd Session:

"Observations on Mosaic Tests." By C. L. C. Burns.

"Guilt Reactions in Child Guidance Cases." By A. G. McClure.

4th Session:

"The Clinical Uses of Mental Tests." By C. J. C. Earl.

"An Interpretation of some Children's Paintings." By M. S. M. Fordham.

5th Session:

"The 'Trivial' and 'Popular' in Psychology." By T. H. Pear.

April 6.

6th Session:

"Education in Reasoning." By R. H. Thouless.

Discussion on: "Propaganda."

Opening Speakers: Rex Knight and F. M. Austin.

7th Session:

Inaugural Meeting of the Social Psychology Section.

Business, followed by a paper.

"Some Socio-Psychological Problems of Factory Life." By Marie Jahoda.

8th Session:

"Some Causes of Juvenile Delinquency and Preventive Measures." By W. L. Chinn.

"Training Industrial Workers." By B. Ungerson.

	9th Session: Discussion on: "So-Called War Neuroses." Opening Speakers: Millais Culpin, T. A. Ross, Edward Glover.
April 7.	10th Session: "Some Traits of Human Behaviour as Revealed by the Study of Brain Injuries." By K. Koffka.
	11th Session: "'Group Spirit'—Comparative Studies of the Formation of Homogeneous Social Attitudes in Small Groups." By O. A. Oeser.
	12th Session: Open Session for Discussion.
May 25, 1940.	General Meeting (arranged by the Industrial Section) in London. "A Critical Account of Public Opinion Measurement." By H. W. Durant. "Individual Differences between Psychological Workers." By J. G. W. Davies.
July 6, 1940.	General Meeting (arranged by the Social Psychology Section) at Oxford. "Overlap of Social Movements." By J. C. Flugel (planned with Pryns Hopkins). "Psychological Aspects of Environment—with special reference to Criminology." By M. Grünhut. "Social Anthropology and Psychology." By A. R. Radcliffe-Brown.
December 14, 1940.	Annual General Meeting in London. Business, including Annual Reports.

SECTIONAL MEETINGS

Medical Section

January 24, 1940.	"Study of a Dream." By Gerhard Adler.
March 13, 1940.	Discussion on: "The Changes in our Psychic Economy caused by the War." Principal Speakers: Edward Glover, H. G. Baynes, Karl Mannheim.
May 22, 1940.	Discussion on: "Anorexia Nervosa." Principal Speakers: S. W. Patterson (for Sir Edmund Spriggs), and W. Clifford M. Scott.

Education Section

March 16, 1940.	(Nottingham.) "Diagnosis of Personality Disturbance by means of the Binet Intelligence Scale." By M. E. Highfield.
April 5, 1940.	2nd Session, Extended General Meeting, at Birmingham. (See under General Meetings, above.)
November 16, 1940.	(Oxford.) "Creative Imagination." By Wm. Stephenson. (A paper on "Musical Ability and Appreciation," by H. D. Wing, was unavoidably cancelled.)

Industrial Section

January 25, 1940.	Discussion on: "Some Applications of Psychology in War Conditions." Principal Speakers: May Smith, H. M. Vernon, T. Bedford, Millais Culpin, Alec Rodger.
February 15, 1940.	"Individual Differences between Psychological Workers." By J. G. W. Davies.
May 25, 1940.	Meeting of the Society, arranged by the Industrial Section. (See under General Meetings, above.)
November 14, 1940.	"Tests for Selecting Technical and Secondary School Children." By Patrick Slater.
December 12, 1940.	"Work under Bombs." By Christine Innes.

Social Psychology Section

April 6, 1940.	7th Session, Extended General Meeting, at Birmingham. Inaugural Meeting of the Section. (See under General Meetings, above.)
July 6, 1940.	Meeting of the Society, arranged by the Social Psychology Section, at Oxford. (See under General Meetings, above.)

BRANCH MEETINGS

Scottish Branch

Session 1939–40

November 18, 1939.	(Glasgow.) "Déjà Vu and the Unconscious." By R. W. Pickford. "The Relationship between Foster Parent and Child." By Liselotte Frankl. "Psychological Problems of Evacuation." By A. H. Bowley.

February 3, 1940.	(Edinburgh.) "Work in progress in some American Universities: an informal review and discussion." By O. A. Oeser. "Colour Sense in Insects." By Dora Ilse.
March 9, 1940.	(Glasgow.) "Some Medico-Psychological and Legal Aspects of Crime." By A. MacNiven. "Examination Anxiety." By J. D. Sutherland.
May 4, 1940.	(Edinburgh.) "Recent Experiments on the Perception of Music." By P. E. Vernon. "Three Group Tests of Intelligence and I.Q.s for Adults." By B. Babington Smith.

Midland Branch.

February 29, 1940.	(Birmingham.) "Individual Psychology." By Dr Plewner, of Vienna.
April 4–8, 1940.	Extended General Meeting of the Society, at Birmingham. (Arranged with the co-operation of the Midland Branch.) (See under General Meetings, above.)
June 1, 1940.	(A meeting arranged to be held at Leicester was unavoidably cancelled.)

Northern Branch.

Note. Owing mainly to travel difficulties and war-time duties, it was found impossible to hold meetings during the year. Members were circularized and the Branch remains in being.

STATEMENT ON THE FUNCTIONS OF THE NATIONAL SERVICE COMMITTEE FOR SOCIAL, ECONOMIC AND STATISTICAL RESEARCH

NATIONAL SERVICE COMMITTEE FOR SOCIAL, ECONOMIC AND STATISTICAL RESEARCH

The Schedule of Reserved Occupations does not make any provision for Economists or workers in the other Social Sciences, who are not whole time members of University staffs, nor does the reservation of Statisticians at thirty completely meet the need for retaining qualified men for work of national importance who may be under thirty. While there is no intention of including these classes in the Schedule, the Minister of Labour and National Service has provided machinery for dealing with them. At his invitation a Committee, called the National Service Committee for Social, Economic and Statistical Research, has been set up to consider the cases of men of military age who are highly qualified for research work in Statistics, Economics and the Social Sciences. The function of the Committee is to make recommendations to the Ministry of Labour in order that the calling up of such men may be deferred. The Committee consists of representatives of the National Institute of Economic and Social Research, of the Royal Economic Society and of the Royal Statistical Society.

There are two categories in which the Committee may place cases:

Category A. Cases of men identified as Scientific Research Workers, either as Statisticians, Economists or Social Science Research Workers. "Identification" is taken to mean "certification of scientific status" and is dependent upon the qualifications of knowledge and experience in the appropriate research techniques. Where men are placed in this category indefinite deferment of calling-up is usually granted by the Ministry. This is conditional upon such cases passing successfully before the Committee at six-monthly intervals for review. On review evidence of occupation must be submitted so that the Committee may certify that the men in question are engaged wholetime in appropriate occupations of statistical, economic, or social science research work.

Category B. Cases of men who should, from the point of view of the public interest, remain at any rate for a time upon the work in which they are already engaged as statisticians, economists or social science research workers. Recommendations are made for given periods of deferment of calling-up and these may sometimes be made for the specific purpose of allowing time for training a substitute. These two categories are mutually exclusive and the requirements of *A* are more stringent than those of *B*.

The age limits are 25–42 years in the case of Economists and Social Science Research workers, 25–29 in the case of Statisticians. The only permissible exception would be a case of an exceptionally well-qualified and valuable statistician who is under 25.

Direct application can be made to the Committee either by the man himself on his own behalf or by the organization for which he is working. Applicants can state for which category they wish the case to be considered. Where a man applies on his own behalf for inclusion in Category A, the Committee welcomes supporting testimonials from authorities in the scientific field in which he has worked. Where application is made for inclusion in Category B, it should as a rule be supported by a government department interested in the work. All applications should give clear and adequate details of qualifications, research and other relevant experience, and of present occupation.

All whole time members of University staffs engaged in Social, Economic and Statistical research should apply in the first place to their University authorities to find out whether their cases come within the scope of the arrangements for dealing with University staff who are not covered by the Schedule.

All enquiries and requests for application forms should be sent to the Secretary, National Service Committee for Social, Economic and Statistical Research, 6 Duke of York Street, London, S.W. 1.

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[1] It is requested that notification of any errors in this list be sent to Miss Addinsell, 20 West Avenue, Hendon, N.W. 4. All alterations for the next issue should reach the office before May 1st, 1941.

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5. Persons of scientific distinction who have contributed to the advancement of Psychology shall be eligible for election as Honorary Members.

6. Honorary Members shall be entitled to all rights and privileges of membership.

7. Honorary Members may be elected from time to time on the nomination of the Council at any General Meeting of the Society.

8. The Council shall be empowered to institute Sections of the Society, each Section being concerned with a special branch or aspect of Psychology.

9. Election to a Section or Sections shall *ipso facto* constitute election to the Society as a whole and entitle those so elected to receive notice of and to take part in all General Meetings of the Society in addition to the meetings of the Section or Sections to which they belong.

10. Sections shall have the right of electing Sectional Associates who shall receive notice of and shall be permitted to attend all Meetings of the Section or Sections to which they belong. Such Sectional Associates shall however take no part in the Government of the Society or the Sections, and they shall not receive *The British Journal of Psychology.*

10 *a*. Transfer from Sectional Membership to Sectional Associateship may take place on January 1st only, and after not less than six months' notice from the Member of his wish to transfer.

11. The procedure as regards the election of Sectional Associates shall be the same as that in the case of Members.

12. Every Candidate for election to the Society shall be recommended by at least two Members who shall be prepared to furnish

information as to the Candidate's qualifications for membership. No Candidate shall be submitted for election to the Society who has not first been approved by the Council or by a Sectional Committee.

13. A Candidate who has been approved by the Council or by a Sectional Committee shall be nominated for election at the next General Meeting of the Society, or at the next Meeting of the Section respectively.

14. One full week before the Meeting at which the ballot is to take place, the Secretary shall send to each Member a balloting paper containing the names and addresses of the Candidates and the names of their proposers.

15. Any Member unable to attend a Meeting at which a ballot is to take place can vote by sending his balloting paper to the Secretary.

16. One adverse vote in five shall exclude.

17. To vote *for* a Candidate, a Member must prefix a cross to the Candidate's name; to vote *against* a Candidate, he must erase the Candidate's name. Members who wish to record a vote neither for nor against a Candidate must leave the name untouched.

18. Any Member whose subscription remains unpaid for two years may, after receiving due notice, be removed by a resolution of the Council from membership of the Society.

19. Whenever it shall be proposed to remove a Member from the Society for any reason other than failure in payment of subscription, the matter shall be brought as a formal resolution before the Council or one of the Sectional Committees (whichever it shall most concern). In the event of the resolution being passed, a ballot shall be held for the removal of the said Member at the next General Meeting of the Society, or at the next Meeting of the Section respectively. Should two-thirds of the Members voting vote in favour of the removal of the Member, that Member shall be removed from the Society.

20. If at any time it is desired to abolish any Section or Sections, to subdivide any Section or Sections, or to amalgamate two or more Sections, a Special Meeting of the Section or Sections concerned may be called for this purpose according to the conditions laid down in Rule 44. Resolutions passed at any such Meeting shall be reported by the Sectional Secretary or Secretaries concerned to the next Meeting of the Council. Should the Council approve of such resolutions, such resolutions shall immediately take effect. But should the Council formally express disapproval of any or all of the said resolutions, these resolutions shall be considered by an Extraordinary General Meeting of the Society sum-

moned in accordance with the conditions laid down in Rule 44 and the decision of this Meeting shall be final.

In the case of the desire to abolish any Section or Sections, the following alternative procedure may be followed. An Extraordinary General Meeting of the Society shall be summoned in accordance with the conditions laid down in Rule 44, and any resolution passed at this Meeting regarding the abolition of the said Section or Sections shall be final.

OFFICERS, COUNCIL AND SECTIONAL COMMITTEES

21. The business of the Society as a whole shall be conducted by a Council consisting of the President, Deputy President, Vice-Presidents, Treasurer, General Secretary, Librarian, Editors of *The British Journal of Psychology,* one representative each of every Section and Branch to be nominated by the Sectional and Branch Committees, and of six Ordinary Members, and not more than two members co-opted by the Council.

22. The President and Deputy President of the Society shall hold office for three years. The other officers of the Society shall retire annually but shall be eligible for re-election, the Deputy President shall be eligible only once for re-election, and the President shall not be eligible for re-election until after the lapse of a further period of six years. Every President shall at the termination of his period of office become a Vice-President for a period of six years. Co-opted members of the Council shall cease to hold office at the Annual General Meeting of the year of their election.

23. Every year two Ordinary Members of the Council, having served for three years, shall retire and shall be ineligible for re-election until after the lapse of one year.

24. Names of Members to serve on the Council may be suggested by the Council or by any Member by sending the proposed names to the General Secretary at least two weeks before the Annual General Meeting.

24 *a*. Nominations of representatives of the Sections and the Branches shall be sent to the General Secretary at least two weeks before the Annual General Meeting.

25. Nominations for the election of Officers shall be handed in to the General Secretary before the Meeting preceding the Annual General Meeting and be announced at the Meeting preceding the Annual General Meeting.

26. One full week before the Annual General Meeting, the General Secretary shall send to each Member a balloting list containing: (1) The names of the Council; (2) The number of the attendance of members of the Council at the Council Meetings held during the year; (3) The names of those proposed by the Council and Committees or by Ordinary Members to fill the vacancies.

27. The Society may fill all the vacancies among the officers that may occur between two Annual General Meetings by ballot, in accordance with Rule 15, at the next General Meeting, due notice having been given. Similar vacancies among the Ordinary Members of the Council shall be filled by co-option by the Council.

28. In the absence of an ex-officio Chairman (in accordance with the conditions laid down in Rule 42) the Council shall elect one of its Members to act as Chairman of Council. A quorum at a Council Meeting shall consist of five. If there be no quorum, the Members attending shall have power to transact business, subject to the approval of absent Members, to whom the resolutions adopted shall be forwarded.

29. The first Meeting of each Special Section shall be convened by the General Secretary of the Society. At this Meeting the Section shall appoint its Chairman, Secretary and Sectional Committee.

30. The Chairman and Secretary of a Section shall retire annually but shall be eligible for re-election.

31. The size of a Sectional Committee shall be determined by the Section. A quorum at a Meeting of a Sectional Committee shall be as that Committee shall decide.

32. When Sections have been formed, Rules 12, 13, 14, 15, 21, 24, 25, 26, 27, 28, 40, 41, 42, 43, 44 shall (*mutatis mutandis* and unless expressly stated to the contrary) apply respectively to the Committees, Chairmen and Secretaries appointed by these Sections.

33. The Society shall not make any dividend, gift, division or bonus in money unto or between any of its Members.

SUBSCRIPTIONS AND FINANCE

34. Each Ordinary Member shall pay an annual subscription of one guinea, which shall entitle him to receive a copy of *The British Journal of Psychology*, with the exception of such additional portions of the *Journal* as are devoted to special branches or aspects of Psychology and are published separately.

35. Ordinary Members who are members of all Sections shall pay an inclusive annual subscription of £2. 15*s*.*

36. In addition to the Ordinary Membership Subscription Members shall pay an additional fee for every Section which they join. This additional fee shall entitle Members of any Section to receive such additional and separately published portions of *The British Journal of Psychology* as may be devoted to the special branch or aspect of Psychology studied by the Section. The amount of such additional fee shall be fixed by the Committee of the Section concerned in consultation with the Treasurer, and any resolution passed by the Sectional Committee with reference to such fee shall, before coming into force, receive the approval of the Council.

37. Sectional Associates shall pay a subscription the amount of which shall be determined by the Sectional Committee in consultation with the Treasurer of the Society.

38. The subscription is payable in advance and becomes due on January 1st. *The British Journal of Psychology* shall be sent only to Members whose subscriptions have been duly paid.

39. The Council shall grant to each Section permission to incur such expenses as may be necessary for the work of the Section; the approximate amount of such expenses to be determined by the Council.

MEETINGS

40. The Annual General Meeting shall be held in December, when the General Secretary's Report and the Treasurer's Statement of Accounts shall be laid before the Society.

41. The General Meetings of the Society shall be at such times and places as the Council shall decide, but in each year there shall be at least four meetings.

42. The President, Deputy President, or failing them a Vice-President, shall, whenever possible, act as Chairman at the Meetings of the Council and of the Society. In the absence of the President, Deputy President, or a Vice-President, some other Member shall, on the motion of the General Secretary or his substitute, be elected to act as Chairman.

43. The Secretary shall send to all Members of the Society notices of each Meeting at least seven days beforehand, and of the business to be transacted at the Meeting.

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* *Subject to adjustment due to the formation of a new Section of the Society.*

44. An Extraordinary General Meeting may be summoned at any time by the Council, or by the General Secretary on the written request of twenty Members; at least fourteen days' notice of such Meeting shall be sent to each Member of the Society.

VISITORS

45. Each Member shall have the privilege of introducing two visitors at any Meeting. The Council or a Sectional Committee shall however have the power of closing any Meeting or Meetings to visitors, provided notice to this effect be given on the notice convening such Meeting or Meetings. The names of visitors together with the names of Members introducing them shall be entered in a book provided for that purpose. Any Member of the Society attending a Meeting of a Section to which he does not belong must be introduced by a Member of that Section.

BRANCHES

46. The Council shall be empowered to sanction and dissolve the establishment of Branches of the Society throughout the British Empire. Members of such Branches shall pay the same subscription as that of Ordinary Members direct to the Treasurer of the Society and be entitled to the same rights and subject to the same rules as Ordinary Members. The Council shall be empowered to refund to the Treasurer of any Branch such proportion of Branch Members' subscriptions as the Council may determine to meet local expenses.

46 *a*. Any Rules made by Branches of the Society shall be first submitted to the Council for their approval.

46 *b*. The minimum number of Members necessary to form a Branch shall be 10.

46 *c*. Branches shall be required to present a report to each Annual General Meeting.

46 *d*. Branches shall have the right of electing Branch Associates under conditions similar to those governing the election of Sectional Associates.

RULES

47. The Rules of the Society may be altered at the Annual General Meeting, after notice of alteration has been given at a previous Ordinary General Meeting, or they may be altered at an Extraordinary General Meeting summoned for that purpose. Such Extraordinary General Meeting shall be held in London, and the purpose for which it is called shall be expressly stated in the notice convening the Meeting. No other business shall be transacted thereat.

BRITISH PSYCHOLOGICAL SOCIETY

NOTE. The Society's Library has been removed from Russell Square and is now housed for the duration of the war at University College, Nottingham, by kind permission of the Council and Senate of that College. The usual facilities for reference are available for those members able to use the Library at Nottingham. It is not possible to lend volumes.

Members who wish to confirm references or to obtain other information by post are asked to write to Mr G. Ellis Flack, M.A. (Librarian) at University College, University Park, Nottingham, and not to members of the University Staff.

LIBRARY RULES

1. The Library of the Society shall ordinarily be open for the use of members from 10 a.m. to 5 p.m. (Saturdays, 10 a.m. to 1 p.m.).

2. Persons other than members of the Society may use the Library only on obtaining permission from the Hon. Librarian. Such permission shall as a rule be granted only to scientists or research students who are known personally or by reputation to the Hon. Librarian, or who are introduced to him by a member of the Society. Such persons must in all cases have declared their willingness to conform to the rules regulating the use of the library by members.

3. Members must on each visit to the library sign the book provided for that purpose.

4. No book may be marked, annotated, mutilated, or defaced in any way.

5. A member shall be responsible to the Society for any loss or damage occurring to a book while in his use or possession.

6. No books may be removed or borrowed from the library.

LIST OF PERIODICALS AND SERIAL PUBLICATIONS CONTAINED IN THE LIBRARY (1940)

* Denotes publications from year given up to date.

Italics denote publications added to the Library since last publication of list.

*Acta Psychiatrica et Neurologica (with Supplements). 1938–
*Acta Psychologica. 1935–
*Action et Pensée (Bulletin de la Société Internationale de Psychagogie et de Psychothérapie). 1925–
**American Association on Mental Deficiency: Proceedings.* 1936–
American Journal of Insanity. 1903–1915.
*American Journal of Orthopsychiatry. 1930–
*American Journal of Psychiatry. 1921–
*American Journal of Psychology. 1888–
*Annales médico-psychologiques. 1921–
*l'Année psychologique. 1909–
*Archiv fur die gesamte Psychologie. 1903–

Archiv fur Gewerbepathologie und Gewerbehygiene. 1930–1932.
Archiv für Kriminologie. 1922–1930.
*Archives de psychologie. 1902–
*Archives of Neurology and Psychiatry. 1919–
*Archives of Psychology. 1907–
*Archivio generale di neurologia e Psychiatria. 1920–. (Now *Archivio de Psicologia, Neurologia, Psichiatria e Psicoterapia.* 1939–.)
*Australasian Journal of Psychology and Philosophy. 1923–
Berichte uber den 1–9 Kongress fur experimentelle Psychologie. 1904–1924.
Brain. 1914–1921.
*British Journal of Educational Psychology. 1931–
*British Journal of Medical Psychology. 1920–
*British Journal of Psychology (General Section). 1904–
*British Journal of Psychology Monograph Supplements. No. 1–
*Buletin Eugenic si Biopolitic. 1936–
Canadian Journal of Mental Hygiene. 1919–1922.
*Catholic University of America Studies in Psychology and Psychiatry. 1926–
*Character and Personality. 1932–
Columbia University Contributions to Education. (Selected numbers.)
*Comparative Psychology Monographs. 1922–
Dictionary of Psychology (Warren).
Die Experimentelle Padagogik. 1905–1910.
*Educational Research Bulletin. 1928–
*l'Encéphale. 1927–
*Eugenics Review. 1922–
Fortschritte der Psychologie. 1913–1922.
Forum of Education (*now incorporated with the* British Journal of Educational Psychology). 1923–1930.
*Genetic Psychology Monographs. 1926–
Grenzfragen des Nerven- und Seelenlebens. 1900–1926.
(The) Human Factor (Journal of the N.I.I.P.) (*now* Occupational Psychology). 1932–1937.
*l'Hygiène Mentale. 1927–
*Imago. 1913–
*Indian Journal of Psychology. 1926– (*set incomplete*).
*Industrial Health Research Board Reports. No. 1–
Industrial Psychology. 1926–1928.
*Industrielle Psychotechnik. 1924–
*International Journal of Psycho-Analysis. 1920–
International Zeitschrift für Individualpsychologie. 1924–1937.
*Internationale Zeitschrift für Psychoanalyse. 1913–
Journal de Neurologie et Psychiatrie. 1927–1929.
*Journal de Psychologie. 1904–
*Journal für Psychologie und Neurologie. 1902–
*Journal of Abnormal and Social Psychology. 1906–
Journal of Animal Behavior. 1911–1917.
*Journal of Applied Psychology. 1917–

LIBRARY UNIVERSITY

Journal of Comparative Neurology and Psychology. 1907–1910.
*Journal of Comparative Psychology. 1921–
*Journal of Educational Psychology. 1910–
*Journal of Educational Research. 1920–
Journal of Experimental Pedagogy. 1911–1921.
*Journal of Experimental Psychology. 1916–
*Journal of General Psychology. 1928–
*Journal of Genetic Psychology (*formerly* Pedagogical Seminary). 1891–
*Journal of Juvenile Research. 1928–
*Journal of Mental Science. 1921–
Journal of the National Institute of Industrial Psychology (*see* The Human Factor). 1924–1932.
*Journal of Nervous and Mental Disease. 1926–
*Journal of Neurology and Psychiatry (*formerly* Journal of Neurology and Psychopathology). 1938–
Journal of Neurology and Psychopathology (*see* Journal of Neurology and Psychiatry). 1920–1937.
*Journal of Parapsychology. 1937–
Journal of Philosophical Studies (*now* Philosophy). 1926–1930.
*Journal of Philosophy. 1911–
Journal of Philosophy, Psychology and Scientific Methods. 1908–1914.
*Journal of Social Psychology. 1930–
*Journal of the Royal Anthropological Institute. 1909–
*Kwartalnik Psychologiczny. 1930–
Man. 1906–1928.
*Mind. 1915–
*München: Arbeiten aus dem Psychologischen Institut der Universitat. 1933–
Nervous and Mental Disease Monograph Series. (Selected numbers.)
*Neue Psychologische Studien. (München.) 1923–
*Occupational Psychology (*formerly* The Human Factor). 1937–
*Organon. 1936–
Padagogisch-psychologische Arbeiten aus dem Institut des Leipziger Lehrervereins. 1911–1931.
*Pedagogical Seminary and Journal of Genetic Psychology (*now known as* Journal of Genetic Psychology). 1891–
*Personnel Journal. 1927–
*Philosophical Review. 1915–
Philosophische Studien (Wundt). 1883–1902.
*Philosophy (*formerly* Journal of Philosophical Studies). 1931–
Praktische Psychologie. 1919–1922.
Proceedings of the Aristotelian Society. 1916–1923.
*Proceedings of the National Academy of Sciences. 1929–
*Proceedings of the Society for Psychical Research. 1910–
**Psicotecnia.* 1939–
*Psyche. 1921–
*Psychoanalytic Quarterly. 1932–
*Psychoanalytic Review. 1913–

die Psychoanalytische Bewegung. 1929–1933.
*Psychological Abstracts. 1927–
*Psychological Bulletin. 1904–
Psychological Clinic. 1908–1935.
Psychological Register. 1929, 1932.
*Psychological Review. 1894–
Psychological Review Index (*now incorporated in* Psychological Abstracts). 1894–1935.
*Psychological Review Monographs. No. 1–
Psychologische Arbeiten (ed. Kräpelin). 1895–1928.
*Psychologische Forschung. 1922–
Psychologische Studien (Wundt) (*see* Neue Psychologische Studien). 1906–1917.
*Psychometrika. 1936–
*Revista de Psihologie. 1938–
*Revue Française de Psychanalyse. 1927–
*Rivista di Neurologia. 1928–
*Rivista di Psicologia. 1905–
Science Progress. 1917–1933.
*Scientia. 1926–
*Smithsonian Institution Publications. 1928–
Training School Bulletin. 1929–1931.
le Travail Humain. 1933–
University of California Publications. 1916–1932.
Yale Psychological Laboratory Studies. 1892–1902.
*Zeitschrift fur angewandte Psychologie. 1908–
*Zeitschrift fur angewandte Psychologie. Beihefte.
Zeitschrift für Neurologie und Psychiatrie. 1910–1914.
*Zeitschrift für pädagogische Psychologie. 1899–
Zeitschrift für psychoanalytische Pädagogik. 1926–1937.
*Zeitschrift fur Psychologie. 1890–
Zeitschrift fur Psychotherapie und medizinische Psychologie. 1909–1915.
*Zeitschrift für Sinnesphysiologie. 1908–

In addition to the above, the Library contains a few numbers only of the following publications:

Archives of Philosophy, Psychology and Scientific Methods. 1905–1906:
Archivos Brasileiros de Hygiene Mental.
Bulletin de l'Institut Général Psychologique. 1915–1933.
Journal of the Department of Letters, University of Calcutta.
Mental Measurement Monographs. 1927–1936.
Polske Archiwum Psychologji. 1926–1935.
Scandinavian Scientific Review. 1922–1924.
Tohoku Psychologica Folia.
Travaux Psychologiques de l'Université Jean Casimir de Lwów, Poland.